ENVIRONMENTAL INDICATOR FORM

CA 725 CURRENT HUMAN EXPOSURES UNDER CONTROL

JOHN F. QUEENY PLANT ST. LOUIS, MISSOURI

Prepared for
Solutia Inc.
575 Maryville Centre Drive
St. Louis, Missouri 63141

September 2002

URS Corporation
2318 Millpark Drive
Maryland Heights, MO 63043
(314) 429-0100
23-20000058.00

Environmental Indicator Forms

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Project #23-20000058.003

Stephanie Doolen

STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.state.mo.us

September 30, 2002

Mr. Michael L. House
Manager, Remedial Projects
Remediation Management Group
Solutia Inc.
J.F. Queeny Plant
P. O. Box 66760
St. Louis, MO 63166-6760

RE: Corrective Action Environmental Indicator Evaluations, Solutia Inc. J.F. Queeny Plant, 201 Russell Blvd., St. Louis, MO 63104, EPA ID #: MOD004954111

Dear Mr. House:

The Missouri Department of Natural Resources' (department) Hazardous Waste Program, in consultation with the U.S. Environmental Protection Agency (EPA) Region VII, has completed two corrective action Environmental Indicator (EI) evaluations for the Solutia Inc. J.F. Queeny, St. Louis, Missouri, facility. As you are aware, the EPA and Congress have recently been interested in developing the means to gauge the progress, on a national level, of human health and environmental protection at corrective action facilities. The enclosed EI evaluations are an outgrowth of that interest. These evaluations represent a "snapshot" of current facility conditions in terms of human exposures to contamination (CA725) and migration of contaminated groundwater (CA750).

The EI evaluation format was developed jointly by an EPA-State work group to address specific corrective action goals established pursuant to the federal Government Performance Results Act (GPRA) of 1993. These corrective action goals are to control human exposures to contamination at 95%, and migration of contaminated groundwater at 70%, of high priority GPRA "baseline" facilities by the end of federal fiscal year 2005. As you may be aware, the J.F. Queeny St. Louis facility is on the GPRA "baseline" list of facilities.

Enclosed are copies of the EI evaluations for the J.F. Queeny facility. The department is pleased to advise you that it has been determined that the human exposures are currently considered under control within the context of the EI evaluations and, for groundwater migration, more information is needed to make a determination. In the future, the department and EPA will

periodically be re-evaluating the status of both EIs and would like to encourage Solutia to continue its efforts to ensure that any future evaluations yield similar, positive results for human health and that appropriate information is collected to ensure that groundwater migration can be demonstrated to be under control.

We appreciate Solutia's thorough and prompt response in providing input for preparation of the department's EI's. Thank you for your continued commitment to environmental protection. If you have any questions about the enclosed EI evaluations, please feel free to contact me at the Department of Natural Resources, Hazardous Waste Program, P.O. Box 176, Jefferson City, MO 65102 or (573) 751-3553 or Ms. Stephanie Doolan of the EPA at (913) 551-7719.

Sincerely,

HAZARDOUS WASTE PROGRAM

Vin Journey, R.G.
Environmental Engineer
Permits Section

VJ:sw

Enclosures

c: Ms. Stephanie Doolan, U.S. EPA Region VII
Ms. Demetra Salisbury, U.S. EPA Region VII

Documentation of Environmental Indicator Determination
in accordance with EPA Interim Final Guidance 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA725)

Current Human Exposures Under Control

Facility Name: **Solutia Inc. J.F. Queeny Plant**
Facility Address: **201 Russell Blvd., St. Louis, MO 63104**
Facility EPA ID #: **MOD 004 954111**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   ✓ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

   The following SWMUs and AOCs were considered in completing this EI.

SWMUs	AOCs
WW Building Area	KK Building Area
Former Boiler Slag Accumulation Area	Former Lab Waste Filtration Unit
Former FF Building Area	
VV Building Area	
Former Acetanilides Production Area	
Former Quarry Area	
Former Coal Storage Yard	
Former Bulk Chemical Storage Area	

These areas are identified in the attached **Figure A-1 (Appendix A)**. The SWMUs/AOCs are also further described in **Appendix A**. The primary source of information concerning these SWMUs/AOCs can be found in the report, "RFI Data Gap Investigation Report," Solutia Inc., dated July 2002. **Appendix B** includes a list of other relevant site investigation reports.

BACKGROUND

Definition of Environmental Indicators (for RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., sitewide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in the RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a

contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale/Key Contaminants
Groundwater	✓			Appendix C, Table C-1
Air (indoors)		✓		See Rationale and References section below
Surface Soil (e.g., <2 ft)	✓			Appendix C, Tables C-2 through C-10
Surface Water	✓			Appendix C, Table C-11
Sediment		✓		See Rationale and References section below
Subsurf. Soil (e.g., >2 ft)	✓			Appendix C, Tables C-2 through C-10
Air (outdoors)		✓		See Rationale and References section below

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__✓__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Appendix C contains tables revised from the RFI Data Gap Investigation Report (July 2002) and Human Health Risk Assessment Report (July 2002) that summarize the results of media screening for the ten SWMUs and AOCs identified in Question 1. These tables summarize Constituents of Potential Concern (COPCs) for groundwater, soil, and surface water (**Tables C-1, C-2** through **C-10, and C-11,** respectively). **Table C-1** contains sitewide groundwater information grouped by hydrostratigraphic zone. **Tables C-2** through **C-10** contain soil information grouped by SWMU/AOC. The rationale for COPC selection is included in **Appendix C**.

Currently, there are no significant groundwater impacts under existing buildings to cause an indoor air concern, however this pathway was evaluated in the human health risk assessment under a future scenario of a new building being constructed over an area of impacted groundwater. Groundwater impacts are described in Section 4.5 of the RFI Data Gap Investigation Report. VOCs in groundwater were modeled for volatilization into indoor air. Outdoor air does not currently pose a concern because of surface cover materials and plant

exposure controls. However, this pathway was evaluated in the risk assessment under a hypothetical future excavation scenario, and this pathway is further discussed in the response to Question 4.

Sediment is not known to be impacted as a result of releases from the facility. The constituents most likely to migrate to the Mississippi River are VOCs, which are highly biodegradable and are not expected to bioaccumulate in sediment. Modeling has been conducted that predicts VOC concentrations to be low and, as such, not expected to result in significant, if any, concentrations in sediment. In addition, there are no applicable standards for human exposure to sediment. The designated uses for this portion of the Mississippi River include: irrigation; livestock & wildlife watering; protection of warm water aquatic life and human health – fish consumption; boating and canoeing; drinking water supply; and industrial (10 CSR 20-7.031, Table H – Stream Classifications and Use Designations, October 31, 2001). However, the area near the facility is primarily used for barge staging and loading/unloading, and is otherwise not conducive to human activities. As such, the exposure potential is low.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media

	Residents	Workers	Day-Care	Excavation/ Construction	Trespassers	Recreation	Food
Groundwater	No	No	No	Yes	No	No	No
	---	---	---	---	---	---	---
Soil (surface, e.g., <2 ft)	No	No	No	Yes	No	No	No
Surface Water	No	No	No	No	No	No	No
	---	---	---	---	---	---	---
Soil (subsurface e.g., >2 ft)	No	No	No	Yes	No	No	No
	---	---	---	---	---	---	---

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media - Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_✓_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Currently, and for the foreseeable future, there are no complete exposure pathways for receptors of concern. The facility is located within a heavily industrialized and commercialized area. The closest residential areas are at least ¼ mile from the facility boundaries. The nearest day care facilities are over ½ mile from the facility. The nearest park is over ¼ mile from the facility. Food crops (commercial scale) are not grown in this area. The frequency of trespassing is expected to be very low. The site is completely fenced and there is 24 hr/day security. Also, there are no special land features, water bodies or wildlife that would cause the facility to be attractive to trespassers. General workers are not potential receptors because most of the areas are covered and there are exposure controls in place (e.g., "no-dig" policy). Further, any emanated vapor or particulates are expected to be extremely low in concentration, if even measurable, due to the significant atmospheric mixing. For the excavation/construction worker, there is no construction currently planned or anticipated; however, this pathway could be complete in the near future (e.g., excavation to repair broken water line). The pathway was quantitatively evaluated in the risk assessment and was considered as a potential "current" scenario for the purposes of this EI. The significance of this pathway is discussed in the response to Question 4.

A Site Conceptual Exposure Model (SCEM) was included in the Human Health Risk Assessment Report (July 2002). The SCEM depicts the potentially complete exposure pathways and the sources and mechanisms by which a receptor might be exposed. The SCEM was developed in coordination with the Missouri Department of Natural Resources (Department) and U.S. EPA. The SCEM reflects current and hypothetical future use scenarios. Most pathways are currently incomplete based on exposure controls. Hypothetical future use scenarios were quantitatively evaluated in the risk assessment under the assumption that the existing exposure controls were removed.

The SCEM indicates that releases to groundwater currently have the potential to migrate to the Mississippi River and pose a potential concern for ecological receptors. Although there are general recreation activities in the river, under current conditions, humans are not receptors of concern for this segment. The area is primarily used for barge staging and loading/unloading, and is otherwise not conducive to human activities. In addition, there are no drinking water intakes in the area.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the

"contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_✓_ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

The results of the Human Health Risk Assessment (July 2002) indicated that risks and hazards are acceptable for current uses of the site. The results indicated that a potentially unacceptable hazard exists for a hypothetical future construction/ excavation scenario in the VV Building Area. In addition, shallow soils pose a potential lead concern in the former Bulk Chemical Storage Area in the absence of current site controls. However, these results do not affect the CA725 evaluation, which reflects current conditions. The site is located in an area that has been industrialized for over 100 years and is expected to remain so for the foreseeable future. Exposure controls are in place which protect workers from potential exposures (e.g., surface cover over impacted areas, security fences, plant safety procedures, etc.). There is a "no dig" policy to minimize or prevent exposure. All physical changes at the plant are subjected to a process hazard analysis prior to approval. Excavation permits are required for any intrusive activity. Copies of relevant plant policies are included in **Appendix D**. **Table E-1** in **Appendix E** summarizes the risks and hazards for the areas evaluated. The risk assessment was performed by competent risk assessment professionals in close cooperation with the Department and U.S. EPA through meetings, communications, and interim deliverables.

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[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits? Not Applicable.

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable") - continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):_____

_____

6. Check the appropriate RCRA Info status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

✓ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Solutia J.F. Queeny facility, EPA ID # MOD004954111, located at 201 Russell Blvd., St. Louis, MO 63104 under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by: (Signature) Vin Journey Date 9/30/02
(Print) Vin Journey, R.G.
(Title) Environmental Engineer II

Supervisor: (Signature) Richard C Nussbaum Date 9/30/02
(Print) Rich Nussbaum, P.E., R.G.
(Title) Corrective Action Unit Chief
(EPA Region or State) State of Missouri

Locations where References may be found: RCRA Facility Investigation, Data Gap Investigation Report, July, 2002 (includes Human Health Risk Assessment), and Hazardous Waste Program: Solutia Inc. (Queeny) TSD Files located at 1738 E. Elm Street, Jefferson City, MO 65101.

Contact telephone and e-mail numbers

(Name) Vin Journey
(Phone #) (573) 751-3553
(E-mail) nrjourv@mail.dnr.state.mo.us

Final Note: The Human Exposures EI is a Qualitative Screening of exposures and the determinations within this document should not be used as the sole basis for restricting the scope of more detailed (e.g., site-specific) assessments of risk.

APPENDIX A

APPENDIX A — SWMU and AOC Descriptions

DESCRIPTION AND STATUS OF SWMUs AND AOCs

The Queeny plant contains eight SWMUs and two AOCs that are currently included in the corrective action program. These areas are:

SWMUs	AOCs
WW Building Area	KK Building Area
Former Boiler Slag Accumulation Area	Former Lab Waste Filtration Unit
Former FF Building Area	
VV Building Area	
Former Acetanilides Production Area	
Former Quarry Area	
Former Coal Storage Yard	
Former Bulk Chemical Storage Area	

These areas have been under investigation since 1983 by either internal investigations performed by Monsanto (Solutia) or investigations performed under RCRA Corrective Action. Solutia has performed several site-wide and SWMU investigations (e.g. hydrogeologic investigations) starting in 1983 and continuing into the late 1980's. During the late 1980's RCRA Corrective Action activities began at the facility with the RFA. The various investigations are discussed below. The following descriptive information on the SWMUs and AOCs was obtained from a combination of two documents:

- RFI Data Gap Work Plan (O'Brien & Gere, 1999)
- RCRA Part B Corrective Action Only Permit Application (Solutia, 1998).

The general locations of the SWMUs and AOCs are illustrated on **Figure A-1**.

KK BUILDING AREA

The KK Building Area is an area approximately 200 feet (ft) by 300 ft, west of the northwest corner of the KK Building. The KK Building is a warehouse that was used for the storage of dry materials. The area is now leased to others. The AOC is an area that was used for the unloading and bulk storage of various raw materials. The unloading and bulk storage area was constructed in the early to mid-1950s and dismantled in the early to mid-1980s. The ground covering in this area is asphalt, concrete, and crushed and compacted stone. The property has been used in the past for pilot production activities and was the location of storage buildings.

APPENDIX A

SWMU and AOC Descriptions

During all AOC investigations to date, a total of 8 soil borings (two borings were used during aquifer testing) were advanced yielding 10 soil samples for analysis VOCs, semivolatile organic compounds (SVOCs), and metals). VOCs are the primary focus based on the results of previous investigations.

The photograph below depicts the KK Building Area, looking southeast.

APPENDIX A — SWMU and AOC Descriptions

WW BUILDING AREA

The WW Building is an existing research and development pilot plant (leased to Monsanto [now a subsidiary of Pharmacia]) that was originally built in approximately 1945-1946. It occupies an area of approximately 75 ft by 105 ft. The SWMU associated with WW Building is the area near the northeast corner of the building where an electrical transformer was located. This transformer, which had Aroclor fluid as a heat transfer medium, was removed from service in the late 1970s. PCBs were reportedly detected in the area during the excavation to construct a concrete pit in the location of the former electrical transformer. Prior to the Data Gap activities, RFI investigations had not been conducted at this SWMU. The ground covering in this area is asphalt and concrete.

The photograph below, looking west, shows a concrete pit where the former transformer was located on the east side of WW Building (behind guard rail).

APPENDIX A — SWMU and AOC Descriptions

FORMER BOILER SLAG ACCUMULATION AREA

The former Boiler Slag Accumulation Area was a small area, approximately 25 ft by 25 ft, located on the northwest corner of the former JJJ boiler house. This coal fired boiler facility was built in the early 1900s and was dismantled in 1992. The Boiler Slag Accumulation Area was used as a cooling spot for the clinkers that came from the bottom of the boiler. The clinkers were placed on this paved spot on the ground by a front-end loader, and when they had sufficiently cooled, were picked up and deposited into a dumpster. The contents were periodically removed for off-site disposal. The ground covering in this area is asphalt, concrete, and gravel.

During all SWMU investigations to date, a total of 14 soil borings were advanced yielding 20 soil samples for analysis (VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins and metals). Key analytes identified through previous investigations include PCBs. According to Solutia, the source of the PCBs was a former transformer substation located nearby.

The photograph below depicts the former Boiler Slag Accumulation Area, looking west.

APPENDIX A — SWMU and AOC Descriptions

FORMER LAB WASTE FILTRATION UNIT AREA

The former Lab Waste Filtration Unit area was the location of an organic/water separator tank (lab waste filtration unit) that was located underground in a concrete vault between Buildings AAA and BM. This organic-water separator was installed when the laboratory was built in the mid-1980s. The lab waste filtration unit collected wastewater from the laboratory facility prior to the wastewater being discharged into the MSD sewer system. On a routine basis, this separator was taken out of service and the organic materials removed for off-site treatment and disposal. The filtration unit was used until a change in MSD standards prompted its removal on August 17, 1990. During the removal, the tank and vault were both observed to be in good condition and undamaged. The tank was removed and the concrete vault was backfilled with clean soil and paved over. VOCs were reportedly detected in the area during the Building AAA and BM Investigation (Monsanto, 1995). Prior to the Data Gap activities, no RFI investigations had been conducted at this AOC.

The photograph below depicts the former location of the Lab Waste Filtration Unit, looking east.

APPENDIX A — SWMU and AOC Descriptions

FORMER FF BUILDING AREA

The FF Building was a production unit used for the manufacture of TCC, a bacteriostat used in body soap. Production of TCC began at the Queeny Plant in 1951, and in early 1991 operations ceased and the facility was dismantled. The FF Building occupied an area of approximately 150 ft by 75 ft. One of the raw materials used in the production of TCC was perchloroethylene or tetrachloroethylene (PCE), which was stored in a UST. The area associated with the FF Building that constitutes the SWMU involves the area around this former leaking UST. The ground covering in this area is asphalt, and crushed and compacted stone. This area is currently not used and no buildings are located in the area.

During all SWMU investigations, a total of 52 soil borings (geological and environmental) were advanced yielding 30 soil samples for analysis (VOCs). The scope of some of the previous investigations focused on geologic characterization, e.g., depth to bedrock. As such, analytical samples were not collected from each boring. VOCs are the primary focus at this SWMU based on the results of previous investigations.

The photograph below depicts the former FF Building Area, looking northeast.

APPENDIX A — SWMU and AOC Descriptions

V V BUILDING AREA

V V Building is an existing structure that is currently serving as the production area known as "Central Drumming." Central Drumming is an area that occupies approximately 150 ft by 225 ft. Activities at this location involve the unloading and bulk storage of a wide variety of liquid materials and the repackaging of these materials or a blend of these materials into smaller quantities (i.e., quarts, gallons, 5-gallon and 55-gallon containers). The identified SWMU area associated with VV Building involves a railcar unloading area where Aroclors were unloaded and pumped into storage prior to repackaging for shipment. This area is a paved alley located between two production areas.

During all SWMU investigations, a total of 33 soil borings were advanced yielding 37 soil samples for analysis (PCBs and pesticides). PCBs are the primary focus based on the results of previous investigations.

The photograph below depicts the V V Building Area, looking south.

APPENDIX A — SWMU and AOC Descriptions

FORMER ACETANILIDES PRODUCTION AREA

The former Acetanilides (or alachlor, also referred to as Lasso™) Production Area is located in the south-central portion of the Queeny Plant. The estimated size of this manufacturing block is 300 ft by 450 ft. This production area began operations in 1966, as a multi-product facility. The Lasso™ operations ceased in 1991. The production facility is still in existence and continues to be used as a multi-product facility. The ground covering in this area consists of buildings, asphalt, concrete foundations of former aboveground storage tanks, and railroad ballast near the railroad tracks.

During all SWMU investigations, a total of 38 soil borings were advanced yielding 48 soil samples for analysis (combinations of VOCs, SVOCs, pesticides, PCBs and metals). Key analytes identified through these investigations include alachlor, chlorobenzene, PCE and other VOCs.

The photograph below depicts a portion of the former Acetanilides Production Area, looking west.

APPENDIX A — SWMU and AOC Descriptions

FORMER QUARRY AREA

The former Quarry Area is located on land which was purchased from American Car and Foundry in 1953. Limestone was quarried via surface mining techniques beginning prior to 1875 (Dry, 1979). It was backfilled with soil, concrete foundations and other miscellaneous rubble. The quarry was completely filled by 1971. The size of the Quarry Area is estimated to be approximately 450 ft by 450 ft with estimated depths in excess of 100 ft. The ground covering in this area is crushed and compacted stone and vegetation. The area is enclosed by a locked security fence. Sources of subsurface impact in this area may be from debris in the fill and the coal deposited here to fill in the quarry.

During all SWMU investigations, a total of 12 soil borings were advanced yielding 22 soil samples for analysis (VOCs, SVOCs, pesticides, herbicides, metals and dioxins). Key analyte groups identified through these investigations include metals, VOCs, and SVOCs.

The photograph below depicts a portion of the former Quarry Area, looking southeast.

APPENDIX A — SWMU and AOC Descriptions

FORMER COAL STORAGE YARD

The former Coal Storage Yard is approximately 2.68 acres of unimproved property purchased in 1982 from Hagar Hinge. The property was used solely for the temporary storage of coal, in anticipation of a coal miners strike. The coal was used for boiler fuel at the Queeny Plant. The use of this area was a "one time" occurrence and the property was later sold to Schaeffer Manufacturing in 1994.

The ground covering in this area is crushed and compacted stone and coal fines. This property is currently used to temporarily store tractor-trailer parts; no buildings are located on the SWMU. The SWMU is located outside of the Queeny Plant main property and site security fence, but it is fenced along the eastern boundary and is partially fenced to the north, south, and west.

During all SWMU investigations, a total of 10 soil borings (4 borings were analyzed as a composite sample in 1988, results are not provided) were advanced yielding 6 soil samples for analysis (VOCs). VOCs are the primary focus based on the results of previous investigations.

The photograph below depicts the former Coal Storage Yard, looking north.

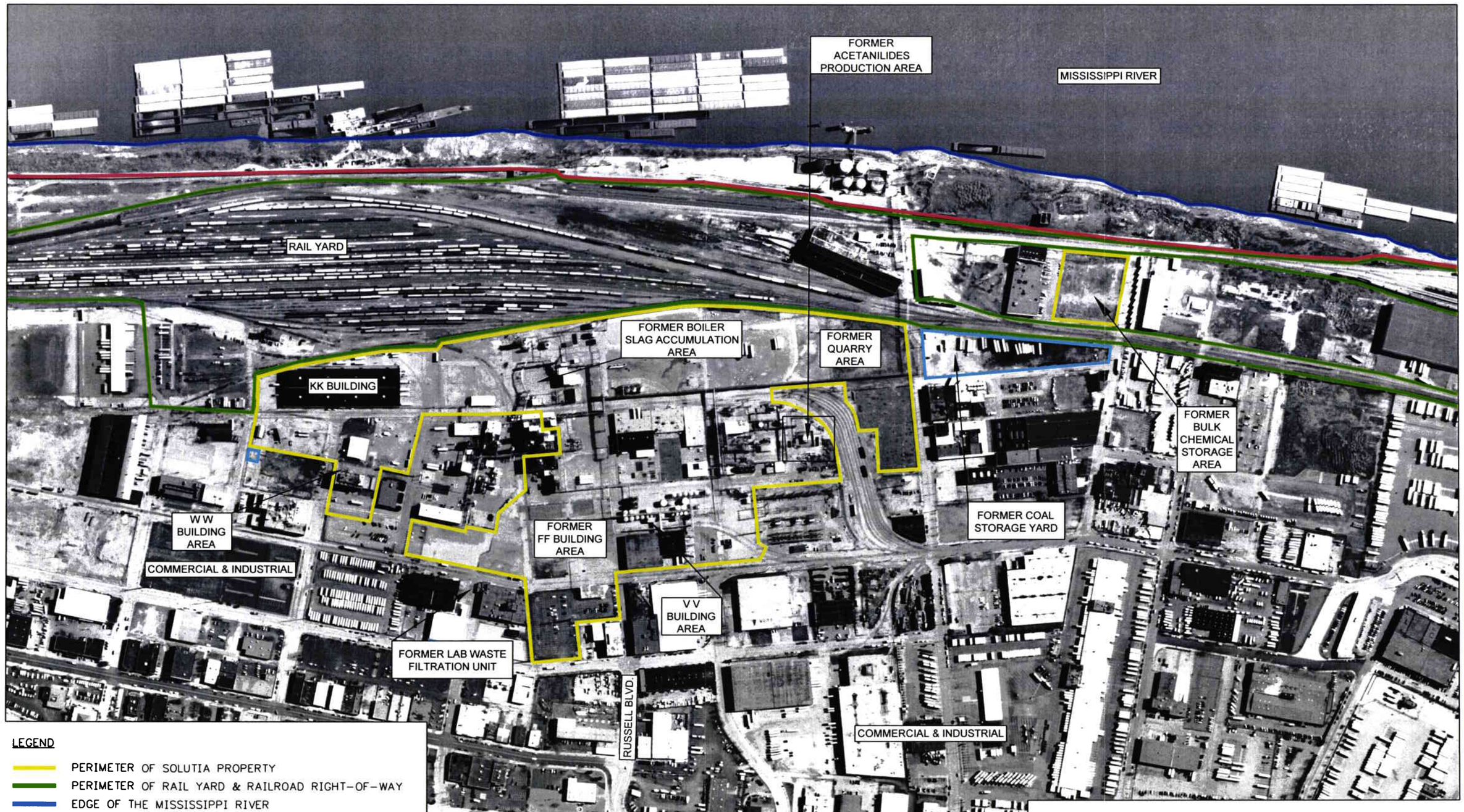
APPENDIX A — SWMU and AOC Descriptions

FORMER BULK CHEMICAL STORAGE AREA

The former Bulk Chemical Storage Area is a rectangular shaped parcel of land approximately 285 ft by 300 ft, or approximately 1.94 acres. It was purchased in 1968 from Clark Oil Company and included two (2) 500,000 gallon aboveground storage tanks and two (2) 300,000 gallon aboveground storage tanks that were used by Clark for fuel storage. After the 1968 purchase, raw materials used at the Queeny Plant were unloaded from a barge terminal, located on the west bank of the Mississippi River, and pumped into these tanks for storage. Materials stored at the terminal by Monsanto and others included: petroleum products, alkyl benzenes, blends of alkyl benzenes (Purex A-220 and Canadian A-221), Santicizer 154 plasticizer (p-t-butylphenyl diphenyl phospate), monochlorobenzene, ortho-nitrochlorobenzene, sodium hydroxide, and potassium hydroxide. The use of this area was discontinued in 1987 and the tanks were removed. This area has at times been leased to other companies. No one is leasing this property at this time and the property is under full Solutia control. The ground covering in this area is asphalt, crushed and compacted stone, and sparse volunteer vegetation. The SWMU is located outside of the Queeny Plant main property and site security fence, but is enclosed by a locked security fence.

During all SWMU investigations, a total of 23 soil borings (nine borings were analyzed as a composite sample in 1988, results are not provided) were advanced yielding 26 soil samples for analysis (VOCs, SVOCs, pesticides, herbicides, metals, dioxins). Key parameter groups identified during previous investigations include VOCs and SVOCs.

The photograph below depicts the former Bulk Chemical Storage Area, looking east. Note the Corps of Engineers flood wall in the background.



LEGEND

- PERIMETER OF SOLUTIA PROPERTY
- PERIMETER OF RAIL YARD & RAILROAD RIGHT-OF-WAY
- EDGE OF THE MISSISSIPPI RIVER
- U.S. ARMY CORPS OF ENGINEERS FLOODWALL
- RFI DATA GAP ACTIVITIES ON NON-SOLUTIA PROPERTY

APPROXIMATE SCALE: 1IN. = 400FT

SOURCE: SURDEX AERIAL PHOTO, FLOWN APRIL 6, 2002

SOLUTIA INC. CURRENT HUMAN EXPOSURES UNDER CONTROL (CA 725) J. F. QUEENY PLANT ST. LOUIS MISSOURI		PROJECT NO. 21560870.00013
URS		
DRN. BY: djd 9/2/02 DSGN. BY: tjo CHKD. BY:	Site Aerial Photograph with SWMUs and AOCs	FIG. NO. A-1

File: E:\23-20000058.001\EIS\AERIAL A-1 (725).DWG Last edited: SEP. 04, 02 @ 12:46 p.m. by: DJDEGUIO

APPENDIX B

APPENDIX B — Previous Site Investigations

SUMMARY OF PREVIOUS SITE INVESTIGATIONS

This section presents a brief summary of pertinent environmental studies and investigations that have taken place at the Queeny Plant. Investigations that have taken place at the facility fall into two categories; internal investigations performed by Monsanto or Solutia, and investigations required under RCRA Corrective Action. Solutia has performed several site-wide and SWMU specific investigations (e.g., hydrogeologic investigations) starting in 1983 and continuing into the late 1980's. During the late 1980's RCRA Corrective Action activities began at the facility with the RCRA Facility Assessment (RFA). The following is an overview of facility-driven and RCRA regulatory compliance investigations for the Queeny Plant.

Preliminary Hydrogeologic Study (Environmental Science & Engineering, Inc. – April 1984)

This study, conducted in 1983, was the first hydrogeological investigation completed at the facility. During the investigation 16 groundwater monitoring wells (MW-1A, MW-1B, MW-2A, MW-2B, MW-3, MW-4, MW-5, MW-6*A*, MW-7A, MW-7B, MW-8A, MW-8B, MW-9, MW-10, MW-11A, MW-11B) were installed and sampled across the facility. Monitoring wells MW-1A, MW-1B and MW-6*A* have since been removed. Groundwater samples were analyzed for total organic carbon (TOC) and total organic halides (TOX). The site geology was logged from the deeper boring from each well cluster by split-spoon sampling. Slug tests were conducted to determine the hydraulic conductivity of the soil formation surrounding the screened section of the well.

Preliminary Hydrogeologic Study Phase II (Environmental Science & Engineering, Inc. – March 1985)

In 1984, Environmental Science & Engineering, Inc. (ESE) installed 12 monitoring wells (*MW-6B*, MW-11C, MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18A, MW-18B, MW-19, and MW-20) that were sampled for the USEPA list of Priority Pollutants. Monitoring wells *MW-6B*, MW-12, and MW-16 have since been removed. Slug tests were conducted on four of these twelve monitoring wells to determine the hydraulic conductivity of the soil formation surrounding the screened section of the well.

APPENDIX B — Previous Site Investigations

Investigation of Perchloroethylene Contamination in Soil and Groundwater near Building FF (Environmental Science & Engineering, Inc. – March 1985)

ESE conducted an investigation of a leaking UST containing PCE located immediately west of the FF Building. During this study, soil samples were collected from eight soil borings to determine the impact to the unsaturated zone. One soil sample from each boring was submitted for laboratory analysis. Four monitoring wells (MW-A through MW-D) were installed and sampled for VOCs (wells have since been removed).

Recovery Well Installation – January 1987

In January of 1987 Monsanto hired Brotcke Engineering Company, Inc. to install four recovery wells (REC-1 through -4) in the FF Building Area. The recovery wells were used to recover free phase PCE associated with the leaking UST. PCE was recovered during the early stages of the effort; however recovery efforts were discontinued after a few months when no additional PCE was recovered.

Evaluation of Groundwater Conditions in the Vicinity of the Lasso Production Area (Geraghty & Miller, Inc. - 1986)

During this investigation, the depth and the areal extent of the free phase alachlor detected in well MW-14 was determined, along with groundwater flow direction in the vicinity of the area. Soil data were collected from 10 soil borings (B-1 through B-5 and GM-1 through GM-5). Groundwater data were collected from five new monitoring wells (GM-1 through GM-5) and existing Monitoring Well MW-14. Monitoring wells GM-4 and GM-5 have since been removed.

Review of Hydrogeologic Investigations at the John F. Queeny Plant (Geraghty & Miller, Inc. - June 1988)

Geraghty & Miller prepared this report to summarize the work completed to date at the plant and to present the information in a single comprehensive document.

Assessment of Hydrogeologic Conditions at the Coal Storage Yard and Victor Street Terminal (Geraghty & Miller, Inc. - November 1988)

Geraghty & Miller conducted an environmental assessment of the former Coal Storage Yard and the Victor Street terminal (former Bulk Chemical Storage Area) to assess groundwater quality and the hydrogeologic conditions at these two sites. During this study, twelve soil borings were drilled and sampled in the former Coal Storage Yard and Victor Street terminal (HB-1 through

HB-3, VB-1 through VB-9, respectively). In addition to the soil borings, three wells (HW-1, HW-2, and HW-3) were installed in the former Coal Storage Yard and two wells (VW-1 and VW-2) were installed at the Victor Street terminal.

Soil samples were screened in the field for VOCs with a photoionization detector (PID). Nine soil borings at the Victor Street terminal were drilled in the upper soils around the former storage tanks to assess if leaks or spills had occurred in the past. Several composite soil samples were collected from inside the diked area and analyzed in Monsanto's in-house laboratory. Three soil borings were completed at the former Coal Storage Yard to aid in the extent assessment.

The three wells in the former Coal Storage Yard were located in the northern, central, and southern portion of the site. Prior to installing the wells, the borings were drilled to bedrock to determine the bedrock depth. The two wells installed at the Victor Street terminal were installed on the eastern or down-gradient side of the facility. Both wells were screened within the perched groundwater table. Prior to the installation of monitoring well VW-1, the boring was drilled to bedrock to determine the bedrock depth. The monitoring wells were sampled for USEPA priority pollutant compounds that included VOCs, acid extractable organics, base/neutral organics, pesticides, PCBs, phenols, total cyanides, and metals. Water levels were also measured to calculate the direction and horizontal gradient of groundwater flow.

Final RCRA Facility Assessment Report for Monsanto-Queeny Plant (Jacobs Engineering Group Inc. - January 1989)

This report by Jacobs Engineering Group documented the Preliminary Assessment (PA) portion of the RFA for the John F. Queeny Plant. The report summarizes the Preliminary Review (PR) phase and the Visual Site Inspection (VSI) phase of the RFA. This report primarily addressed conditions at the site as they existed at the time and did not consider historical conditions. The report gathered and discussed information on releases at RCRA regulated facilities, and evaluated releases of hazardous waste or hazardous waste constituents to soil and groundwater from SWMUs. The report used this information to address the need for further action and interim measures at the facility.

RCRA Facility Investigation (Geraghty & Miller, Inc. - March 1992)

Geraghty & Miller conducted the RFI in accordance with the RCRA facility permit. The purpose of conducting the RFI was to characterize the nature, extent, and rate of migration of

possible releases of chemicals to both soil and groundwater. The field investigation was conducted to supplement the existing data. Investigation activities included soil and groundwater sampling, bedrock coring, aquifer testing, risk assessment, and groundwater modeling.

The four SWMUs evaluated during this investigation were the former Acetanilides Production Area, the former Quarry Area, the former Bulk Chemical Storage Area, and the former Boiler Slag Accumulation Area. The collected soil samples were analyzed for the Title 40 Code of Federal Regulations (CFR) Part 264 Appendix IX constituents, with the exception of the former Acetanilides Production Area where only VOCs were analyzed.

The following activities were completed as part of the RFI:

Soil

- Fourteen soil borings were drilled and samples were collected to characterize the nature and extent of constituents in the unsaturated zone of the former Acetanilides Production and railroad unloading area.
- Four borings were drilled and samples were collected to determine the thickness of the fill material overlying the bedrock in the former Quarry Area.
- Four borings were drilled and sampled to gather soil quality data to characterize the former Bulk Chemical Storage Area.
- A shallow surface sample was collected at the former Boiler Slag Accumulation Area.
- Five borings were advanced into bedrock to examine the lithology of the bedrock and then converted into bedrock monitoring wells (MW-2R, MW-8R, MW-9R MW-13R, and MW-21R) to characterize the quality of the groundwater in the bedrock. Monitoring well MW-9R has since been removed.

Groundwater

Groundwater quality was examined on a site-wide basis.

- One monitoring well (QS-1) was installed in the former Quarry Area to the top of bedrock. This well was used to collect data about the groundwater directly above the bedrock.

- One monitoring well was installed in both the former Coal Storage Yard (HW-1B) and the former Bulk Chemical Storage Area (VW-2B). The function of these wells was to monitor the deep portion of the unconsolidated aquifer.
- Two rounds of water level measurements were conducted to determine groundwater flow direction.
- Two rounds of groundwater sampling were conducted from the 28 monitoring wells to characterize the site-wide groundwater quality.
- Test well TW-1 (8 in. diameter) and observation well OBS-1 (4 in. diameter) were installed in the unconsolidated material in the northern portion of the site to conduct an aquifer test. The aquifer test was a constant rate test to further define the aquifer coefficients (transmissivity, hydraulic conductivity, and storativity) of the unconsolidated aquifer. The aquifer coefficients were used for the development of a two-dimensional, steady state, ground-water flow model. The model was used to characterize the fate and transport of constituents in the groundwater, and to predict the concentrations of constituents that may enter the Mississippi River.
- Slug tests were performed at 10 of the monitoring wells distributed across the site to determine the hydraulic conductivity of the unconsolidated deposits. These data were used to supplement past aquifer testing and the current constant-rate aquifer test.
- A human health and environmental assessment was performed to identify and evaluate the potential risk to future exposures to onsite soil during potential excavation projects and to groundwater discharging to the Mississippi River.

Building FF Phase I Investigation (O'Brien & Gere Engineers, Inc. - July 1993)

In May 1993 an investigation was conducted to investigate the soil and groundwater in the vicinity of the former FF Building, which was dismantled in 1992.

During May and June of 1993 O'Brien and Gere collected a total of 22 groundwater samples. The groundwater samples were collected from 17 direct push borings advanced during the investigation, monitoring well MW-3, and recovery wells (REC-1 through -4). GeoTrace, Inc. using headspace analysis and gas chromatography (GC), analyzed the groundwater samples onsite. No dense non-aqueous phase liquid (DNAPL) was detected in any of the wells during the

investigation. In addition, 10 soil samples were collected from soil borings SB-1 through SB-5 and analyzed for PCE and trichloroethene (TCE) by method SW-8240.

A series of cone penetrometer tests (CPTs) were also conducted during this investigation to assess the depth to bedrock in the area of the former FF Building. Piezometers were then installed based on the information gathered from the CPT study. Upon the completion of the piezometer installation, a groundwater survey and sampling event were conducted.

Building FF Phase II Investigation (O'Brien & Gere Engineers, Inc. - November 1993)

O'Brien & Gere Engineers completed a Phase II investigation to further delineate the impacted soil and groundwater. During the investigation groundwater samples were collected from GP-22 through GP-30 and analyzed for both TCE and PCE. Twelve soil samples (SB-7 through SB-12) were also collected and analyzed for TCE and PCE. Groundwater levels were measured from the four existing wells to determine groundwater flow.

LNAPL Subsurface Investigation (O'Brien & Gere Engineers, Inc. - June 1994)

O'Brien & Gere Engineers completed this investigation to assess the limits of the free phase LNAPL that was observed in a piezometer located north of the former FF Building Area during the FF Building Phase I Investigation conducted in July of 1993. O'Brien and Gere collected and analyzed eight groundwater samples from Geoprobe borings (GPT-1 through GPT-8) for total VOC analysis via onsite analysis. The investigation was used to present the lateral extent of the free phase.

Phase II RCRA Facility Investigation (Geraghty & Miller, Inc. - June 1994)

At the request of the Monsanto Company, and in response to USEPA letters dated September 17, 1992 and June 2, 1993, Geraghty & Miller, Inc. completed Phase II of the RFI at the Queeny Plant. Phase II was conducted in accordance with the RCRA facility permit. The purpose of conducting the Phase II was to supplement the Phase I investigation and to further characterize the nature, extent, and rate of migration of possible releases of chemicals to both soil and groundwater. The field investigation was conducted during the fall of 1993 and the spring of 1994. Investigation activities included soil and groundwater sampling, a monitoring well

abandonment, and an inventory of the site monitoring wells. Phase II activities are summarized below.

Soil

- Fifteen soil samples were collected in the former Acetanilides Production Area/railcar unloading area to delineate the areal extent of alachlor in the soil.
- Soil samples were collected from eight borings in the former Bulk Chemical Storage Area to determine any residual impact from the former storage tanks.
- Soil samples were collected around the former Boiler Slag Accumulation Area pad to delineate the horizontal and vertical extent of soils potentially impacted with PCBs and metals.
- Soil samples were collected from four borings located west of the KK Building Area to determine the possible impact to the soil from the former aboveground storage tanks.
- Soil samples were collected from three specified locations and depths in the former Coal Storage Yard to verify historic PID measurements above background in the vadose zone.
- Soil samples were collected at 33 locations in the V V Building Area to delineate the horizontal and vertical extent of PCB impacted soil.
- Four soil borings were drilled and sampled to determine the northern extent of the former Quarry Area.
- Background samples for metals were collected from three locations in the northwest parking lot.

Groundwater

- Groundwater samples were collected from Monitoring Well MW-13 and at six geoprobe locations surrounding the well to identify the source of a historical detection of p-chloraniline in well MW-13. Soil samples were also collected to determine the source of p-chloraniline around MW-13.
- Groundwater samples were collected from monitoring well MW-20 and at two geoprobe locations surrounding the well to identify the source of a historical detection of cyanide in

MW-20. Soil samples were also collected to determine the source of cyanide around MW-20.

- Groundwater samples were collected from 11 monitoring wells (GM-1, GM-3, GM-5, MW-3, MW-4, MW-5, MW-11B, MW-13, MW-14, MW-15, AND QS-1) and three geoprobes (GM-1A, GM-1B, and GM-1C) locations. These samples served to delineate the extent of the alachlor at the former Acetanilides Production Area/railcar unloading area.
- Groundwater sampling was conducted at six wells (VW-2, MW-3, MW-8A, MW-13, MW-14, and OBS-1) for analysis of VOCs to resolve sample analysis dilution problems previously encountered.
- Groundwater samples were collected from three monitoring wells (MW-13, MW-15, and MW-20) to determine the mobile fraction of metals in groundwater.
- Seven wells (GM-1 through GM-5, MW-14, and VW-2) were gauged for the presence of non-aqueous phase liquids (NAPLs).
- Monitoring Well MW-9R, screened in the bedrock, was abandoned.

Buildings AAA and BM Investigation (Monsanto Company-April 1995)

The University of Missouri conducted an environmental assessment of Buildings AAA and BM prior to a proposed donation of these properties to the university. Five soil samples were collected and analyzed for dioxins. Groundwater samples were also collected from eight monitoring wells (MW-1 through MW-8) and analyzed for VOCs, SVOCs, total petroleum hydrocarbon (TPH), and metals.

RCRA Facility Investigation Data Gap Investigation Report (URS Corporation, - July 2002)

At the request of the Solutia, and in response to USEPA Notice of Defiency (NOD) dated July 17, 1997, URS Corporation completed the Data Gap investigation at the Queeny Plant. The Data Gap investigation was conducted in accordance with the Data Gap Work Plan (September 24, 1999), and approved amendments. The purpose of conducting Data Gap investigation was to address the NOD, specifically to collect more data to adequately characterize the nature and extent of on-site and off-site soil and groundwater impact at or from the facility; or provide

adequete information to support further corrective action decisions at the facility. The field investigation was conducted during the summer of 2000. The site investigation activities were designed to verify the existing soil data for the various SWMUs and to provide additional soil and groundwater data to better assess the nature and extent of impact. Investigation activities included a focused soil sampling program, monitoring well installation, groundwater gauging and sampling, LNAPL and DNAPL investigation, and a monitoring well integrity assessment and upgrade. Data Gap activities are summarized below.

Soil

A focused soil sampling program was conducted to meet the project objectives as outlined in the Data Gap Work Plan. A total of 18 soil borings were advanced. The project objectives include the following.

- Obtain additional surface soil samples to confirm the results of prior sampling for risk assessment purposes.

- Two soil borings (SB-A and SB-B) were drilled and samples were collected in the former Acetanilides Production Area. Boring SB-B was drilled near existing location AC-3 and boring SB-A was drilled near existing location AC-4 as called for in the work plan.

- Three soil borings (SB-C1, SB-C2, and SB-C3) were drilled and samples were collected in the former Quarry Area. The borings were near existing locations GP-1 and QS-3.

- Two soil borings (SB-D and SB-E) were drilled and samples were collected in the former Bulk Chemical Storage Area. Boring SB-D was drilled during the well installation on the northeast side of the area. Boring SB-E was drilled near existing locations VS-5 and VS-6.

- Two soil borings (SB-F and SB-G) were drilled and samples were collected in the KK Building Area. Boring SB-F was drilled west of existing location KP-3 and near the fence line. Boring SB-G was drilled near existing monitoring wells MW-7A and MW-7B.

- Four soil borings (SB-H, SB-I, SB-J, and SB-K) were drilled and surface soil samples were collected in the former Coal Storage Yard. The work plan specified that two samples with the highest PID measurements be submitted for analysis. Samples from borings SB-H and SB-I were collected between existing locations HB-3GP and HB-2GP, these historically had

the highest VOC results. Boring SB-J was drilled between existing locations HW-2GP and HB-1. The sample from boring SB-K was not submitted for analysis due to low PID measurements.

- Assess the nature and extent of PCBs in subsurface soils at the WW Building Area.

- Four soil borings were advanced at the WW Building Area to assess the potential presence and extent of PCBs in soils. Fourteen soil samples were collected and field-tested by immunoassay analysis for PCBs using Strategic Diagnostics Inc. Ensys™ PCB Soil Test Kit, EPA Method 4020. The kits are designed to produce a positive, colorimetric result at a detection limit of 2 milligrams per kilogram (mg/kg). The results for nine of the samples were clearly below the detection limit (non detect). The other five of the fourteen samples that were field-tested were submitted to Severn Trent Laboratories (STL) for confirmatory analysis. Of these five, only one sample produced a clear, positive colorimetric result. The other four samples did not produce a definitive result but were submitted for analysis to be conservative; the additional four samples were chosen based on the color gradations closest to a positive result produced by the field test. Upon receipt of preliminary laboratory results, a step-out boring was drilled to the south and samples were collected at two predetermined depths.

- Assess the nature and extent of potential VOCs at the former Lab Waste Filtration Unit.

- One soil boring (SB-M) was completed in the former Lab Waste Filtration Unit. One soil sample was collected from the bottom depth of the former unit (6 ft). No VOCs were noted from this boring based on field PID measurements. As such, a temporary piezometer was not installed, per the work plan.

Groundwater

Monitoring Well Installation, Development, Sampling, and Groundwater Level Measurements

A total of 13 monitoring wells (MW-22, -23, -24A, -24B, -25A, -25B, -26, -27, -28A, -28B, -29, -30A, and –30B) were installed during this investigation to provide additional groundwater data for determining the nature and extent of groundwater impact. There are currently a total of 65 monitoring wells and piezometers at the site.

APPENDIX B Previous Site Investigations

The locations of the new monitoring wells were based on the laboratory analytical results for groundwater samples collected during previous investigations and are positioned to fill data gaps.

Groundwater monitoring wells were installed in the areas identified below; and the data from these wells were specifically used for the following purposes, as outlined in the Data Gap Work Plan.

- One well (MW-22) was installed near the former Acetanilides Production Area southeast of Monitoring Well MW-4, and screened in the silty clay. This well was intended to provide downgradient data from the former Acetanilides Production Area and assess the potential for off-site migration.

- One well (MW-23) was installed along the east perimeter of the site between Monitoring Well MW-10 and MW-13, and screened in the fill. This well was intended to provide downgradient data from the former Acetanilides Production Area and assess the potential for off-site migration.

- Two sets of wells were installed in the former Bulk Chemical Storage Area to provide downgradient data and to assess the potential for off-site migration. Wells MW-24A and MW-24B were installed along the south end of the former Bulk Chemical Storage Area. Well MW-24A was screened in the fill and well MW-24B was screened in the sand. Wells MW-25A and MW-25B were installed along the east side of the former Bulk Chemical Storage Area, and located north of well VW-2. Well MW-25A was screened in the fill and well MW-25B was screened in the sand.

- One well (MW-26) was installed along the east perimeter of the site to the south of MW-13R, and east of the former Quarry Area. MW-26 was screened in the fill. This well was intended to provide downgradient data from the former Quarry Area and assess the potential for off-site migration.

- One well (MW-27) was located along the east perimeter of the site between Monitoring Well MW-9 and MW-10, and screened in the fill. This well was intended to assess the potential for off-site migration.

- Two wells (MW-28A and MW-28B) were installed along the south side of the KK Building Area, and south of well MW-8B. Well MW-28A was screened in the fill and MW-28B was screened in the sand. These wells were intended to provide downgradient data from the KK Building Area and assess the potential for off-site migration.

- One well (MW-29) was located along the east perimeter of the site and on the east side of the KK Building near well MW-8B. The well was screened in the sand just above the bedrock. This well was intended to provide downgradient data from the KK Building area and to assess the potential for off-site migration.

- Two wells (MW-30A and MW-30B) were installed at the northeast corner of the site and located north of the KK Building Area. Well MW-30A was screened in the fill or silty clay and well MW-30B was screened in the sand. These wells were intended to provide data downgradient from then KK Building Area and assess the potential for off-site migration.

During the borings for the monitoring wells, two soil samples were generally collected from each well location and analyzed for TOC. One sample was collected from the saturated zone and one from the unsaturated zone.

Existing monitoring wells were developed using air-assisted purging equipment mounted on a trailer to remove fines from the well screen and filter pack.

LNAPL *and DNAPL* Investigation

A subsurface investigation was conducted by geoprobing for soil characterization and groundwater collection via temporary piezometers in the former FF Building Area. The primary objective of this work was to further characterize the extent of previously identified LNAPL. In addition to the geoprobing, piezometer LPZ-4 was bailed to assess the rate of LNAPL recovery. Also, Recovery Wells REC-1 through REC-4 were gauged to assess the presence of DNAPL.

Monitoring Well Integrity Assessment and Upgrades

Personnel from the MDNR were onsite on June 14-15 to conduct a RCRA Observation and Maintenance Audit and on June 29 to split groundwater samples. On July 7, 2000, Solutia received a letter (via fax) from USEPA transmitting MDNR's concerns with the potential integrity of 23 of the existing monitoring wells as documented during the field audit. In response to the letter, on July 10-11 URS Corp (URS) conducted a field evaluation of the conditions of the

23 monitoring wells to better understand the conditions and to help address the issues. On July 13, Solutia sent a response letter to the USEPA and MDNR with the findings of URS's evaluation. As indicated in the letter, Solutia directed URS to install a new pad at well HW-1, and to replace almost all of the well slip caps[1] with tightening J-plugs.

During the redevelopment of well REC-1, it was discovered that the top of the well casing appeared to have a slight breech where water was seeping in. As an apparent result, the well contained approximately 17 ft. of sediment. Based on a phone conversation between Kurt Hollman (MDNR) and Bob Billman (URS) on July 6, 2000, it was decided that REC-1 could be sampled if the sediment was removed and the well screen determined to be intact.

URS believes that the integrity of those wells had not been compromised. The wells were sampled according to the criteria outlined in the work plan and as amended via correspondence between Solutia and the USEPA. The well development/purging and sampling procedures were sufficient to indicate the wells were functioning properly. As such, the wells were judged to be capable of providing representative groundwater samples. This was agreed to by USEPA and MDNR via verbal communication (reference Quarterly Report Nos. 41 and 42). Furthermore, the data validation process deemed the associated analytical data to be useable.

During the Data Gap field effort, the risers of wells REC-1 through REC-4 were extended to bring them closer to ground surface. These wells are located inside manholes and, as originally configured, were considered a confined space for entry purposes. This modification was discussed with the USEPA oversight representative and approved through MDNR.

[1] The configuration of some of the risers prevented the installation of J plugs.

APPENDIX C

APPENDIX C
INFORMATION REGARDING TABLES C-1 THROUGH C-11

Table C-1

This table depicts groundwater data for constituents that exceeded federal maximum contaminant levels (MCLs) (obtained via Internet March 2001) or, where MCLs did not exist, USEPA Region 3 Risk Based Concentrations (RBCs) for tap water (October 2000). These analytes represent Constituents of Potential Concern (COPCs) for the human health risk assessment. This table was modified from Table 4-4 of the Data Gap Investigation Report (July 2002).

Tables C-2 through C-10

These tables depict soil data for constituents that exceeded the lower of the following criteria:

- Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and Leaching to Groundwater values (September 2001);
- USEPA Region 3 RBCs for industrial exposure (October 2000); or
- USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000).

These tables were modified from Tables 2-1 through 2-9 of the human health risk assessment (July 2002). There are slight differences between the two sources in that Tables C-2 through C-10 have been revised to reflect the September 2001 revision to the CALM tables.

Table C-11

This table depicts the concentrations of constituents potentially migrating and discharging to the Mississippi River based on a groundwater flow model, as reported in the Data Gap Investigation Report (July 2002). For comparison purposes, the table also includes federal recommended ambient water quality criteria, for the protection of human health based on consumption of water and organisms (USEPA, 1999).

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
GM-1	06/20/00	8260	Chlorobenzene	180000	ug/l	D		100	UG/L	Fed MCL
GM-1	06/20/00	8141	Alachlor	130000	ug/l			2	UG/L	Fed MCL
GM-2	06/30/00	8260	Chlorobenzene	70000	ug/l			100	UG/L	Fed MCL
GM-2	06/30/00	8260	Ethyl methacrylate	1400	ug/l	J		550	UG/L	RBC
GM-3	07/06/00	8260	Chlorobenzene	5900	ug/l			100	UG/L	Fed MCL
GM-3	07/06/00	8141	Alachlor	9.9	ug/l	P	J	2	UG/L	Fed MCL
HW-2	07/26/00	8260	Benzene	6.8	ug/l		J	5	UG/L	Fed MCL
HW-2	07/26/00	8260	Chloroform	2.2	ug/l	J		0.15	UG/L	RBC
HW-2	07/26/00	8260	Chloromethane	3.6	ug/l	J		2.1	UG/L	RBC
HW-2	07/26/00	8260	cis/trans-1,2-Dichloroethene	1100	ug/l	D		55	UG/L	RBC
HW-2	07/26/00	8260	Tetrachloroethene	9.6	ug/l			5	UG/L	Fed MCL
HW-2	07/26/00	8260	Trichloroethene	16000	ug/l	D		5	UG/L	Fed MCL
LPZ-1	07/14/00	8260	Benzene	68	ug/l	J		5	UG/L	Fed MCL
LPZ-1	07/14/00	8260	Chlorobenzene	660	ug/l			100	UG/L	Fed MCL
LPZ-1	07/14/00	8260	cis/trans-1,2-Dichloroethene	19000	ug/l			55	UG/L	RBC
LPZ-1	07/14/00	8260	Tetrachloroethene	170	ug/l	J		5	UG/L	Fed MCL
LPZ-1	07/14/00	8260	Toluene	310000	ug/l	D		1000	UG/L	Fed MCL
LPZ-1	07/14/00	8260	Trichloroethene	3200	ug/l			5	UG/L	Fed MCL
LPZ-1	07/14/00	8260	Vinyl chloride	2500	ug/l			2	UG/L	Fed MCL
LPZ-2	06/27/00	8260	cis/trans-1,2-Dichloroethene	820	ug/l			55	UG/L	RBC
LPZ-2	06/27/00	8260	Methylene chloride	1500	ug/l	JB	J	4.1	UG/L	RBC
LPZ-2	06/27/00	8260	Toluene	70000	ug/l			1000	UG/L	Fed MCL
LPZ-2	06/27/00	8260	Vinyl chloride	460	ug/l			2	UG/L	Fed MCL
LPZ-3	07/27/00	8260	Benzene	66	ug/l	J		5	UG/L	Fed MCL
LPZ-3	07/27/00	8260	Chlorobenzene	130	ug/l	J		100	UG/L	Fed MCL
LPZ-3	07/27/00	8260	Methylene chloride	18	ug/l	JB	J	4.1	UG/L	RBC
LPZ-3	07/27/00	8260	Toluene	4200	ug/l			1000	UG/L	Fed MCL
LPZ-4	08/01/00	8260	Benzene	770	ug/l	J	J	5	UG/L	Fed MCL
LPZ-4	08/01/00	8260	Chlorobenzene	2300	ug/l	J		100	UG/L	Fed MCL
LPZ-4	08/01/00	8260	cis/trans-1,2-Dichloroethene	4100	ug/l			55	UG/L	RBC
LPZ-4	08/01/00	8260	Tetrachloroethene	3800	ug/l			5	UG/L	Fed MCL
LPZ-4	08/01/00	8260	Toluene	660000	ug/l	D		1000	UG/L	Fed MCL
LPZ-4	08/01/00	8260	Trichloroethene	3100	ug/l			5	UG/L	Fed MCL
LPZ-4	08/01/00	8260	Vinyl chloride	2400	ug/l			2	UG/L	Fed MCL
LPZ-5	07/14/00	8260	Benzene	300	ug/l	J		5	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
LPZ-5	07/14/00	8260	Chlorobenzene	15000	ug/l			100	UG/L	Fed MCL
LPZ-5	07/14/00	8260	cis/trans-1,2-Dichloroethene	750	ug/l	J		55	UG/L	RBC
LPZ-5	07/14/00	8260	Toluene	170000	ug/l			1000	UG/L	Fed MCL
LPZ-5	07/14/00	8260	Vinyl chloride	840	ug/l			2	UG/L	Fed MCL
MW-2B	07/25/00	8260	cis/trans-1,2-Dichloroethene	220	ug/l			55	UG/L	RBC
MW-2B	07/25/00	8260	Vinyl chloride	18	ug/l			2	UG/L	Fed MCL
MW-3	06/20/00	8260	cis/trans-1,2-Dichloroethene	400	ug/l			55	UG/L	RBC
MW-3	06/20/00	8260	Tetrachloroethene	310	ug/l			5	UG/L	Fed MCL
MW-3	06/20/00	8260	Trichloroethene	160	ug/l			5	UG/L	Fed MCL
MW-3	06/20/00	8260	Vinyl chloride	14	ug/l			2	UG/L	Fed MCL
MW-3	06/20/00	8270	Benzo(a)pyrene	0.48	ug/l	J		0.2	UG/L	Fed MCL
MW-4	07/13/00	8260	Chlorobenzene	240	ug/l	D		100	UG/L	Fed MCL
MW-4	07/13/00	8270	Benzo(a)anthracene	0.39	ug/l	J		0.092	UG/L	RBC
MW-4	07/13/00	8141	Alachlor	13	ug/l			2	UG/L	Fed MCL
MW-4 DUP	07/13/00	8260	Chlorobenzene	300	ug/l	D		100	UG/L	Fed MCL
MW-4 DUP	07/13/00	8141	Alachlor	12	ug/l			2	UG/L	Fed MCL
MW-5	06/21/00	8141	Alachlor	6	ug/l			2	UG/L	Fed MCL
MW-9F	06/23/00	6010	Thallium	0.005	mg/l	B		0.002	MG/L	Fed MCL
MW-10	06/22/00	6010	Arsenic	0.066	mg/l			0.05	MG/L	Fed MCL
MW-11A	07/24/00	8270	Benzo(a)anthracene	1	ug/l	J		0.092	UG/L	RBC
MW-11A	07/24/00	8270	Benzo(a)pyrene	1	ug/l	J		0.2	UG/L	Fed MCL
MW-11A	07/24/00	8270	Benzo(b)fluoranthene	0.86	ug/l	J		0.092	UG/L	RBC
MW-11A	07/24/00	8270	Benzo(k)fluoranthene	0.95	ug/l	J		0.92	UG/L	RBC
MW-11A	07/24/00	8270	Indeno-(1,2,3-cd)pyrene	0.61	ug/l	J		0.092	UG/L	RBC
MW-11A	07/24/00	6010	Arsenic	0.056	mg/l			0.05	MG/L	Fed MCL
MW-11A	07/24/00	6010	Lead	0.22	mg/l			0.015	MG/L	Fed MCL
MW-11B	06/20/00	6010	Lead	0.087	mg/l			0.015	MG/L	Fed MCL
MW-11C	07/24/00	8260	Chloromethane	2.6	ug/l	J		2.1	UG/L	RBC
MW-11C	07/24/00	8270	Benzo(a)anthracene	0.6	ug/l	J		0.092	UG/L	RBC
MW-11C	07/24/00	8270	Benzo(a)pyrene	0.55	ug/l	J		0.2	UG/L	Fed MCL
MW-11C	07/24/00	8270	Benzo(b)fluoranthene	0.43	ug/l	J		0.092	UG/L	RBC
MW-13	06/19/00	8260	Benzene	720	ug/l			5	UG/L	Fed MCL
MW-13	06/19/00	8260	Chlorobenzene	1400	ug/l	D	J	100	UG/L	Fed MCL
MW-13	06/19/00	8270	Benzo(a)anthracene	0.88	ug/l	J		0.092	UG/L	RBC
MW-13	06/19/00	8270	Benzo(a)pyrene	0.97	ug/l	J		0.2	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
MW-13	06/19/00	8270	Bis(2-ethylhexyl)phthalate	7.5	ug/l	J		6	UG/L	Fed MCL
MW-13	06/19/00	8270	Indeno-(1,2,3-cd)pyrene	0.83	ug/l	J		0.092	UG/L	RBC
MW-13	06/19/00	8270	p-chloroaniline	660	ug/l	D		150	UG/L	RBC
MW-13	06/19/00	8141	Alachlor	3.3	ug/l	N	J	2	UG/L	Fed MCL
MW-13	06/19/00	6010	Lead	0.11	mg/l			0.015	MG/L	Fed MCL
MW-13 Dup	06/19/00	8260	Benzene	780	ug/l			5	UG/L	Fed MCL
MW-13 Dup	06/19/00	8260	Chlorobenzene	1400	ug/l	D	J	100	UG/L	Fed MCL
MW-13 Dup	06/19/00	8270	Benzo(a)anthracene	0.66	ug/l	J		0.092	UG/L	RBC
MW-13 Dup	06/19/00	8270	Benzo(a)pyrene	0.87	ug/l	J		0.2	UG/L	Fed MCL
MW-13 Dup	06/19/00	8270	Indeno-(1,2,3-cd)pyrene	0.71	ug/l	J		0.092	UG/L	RBC
MW-13 Dup	06/19/00	8270	p-chloroaniline	560	ug/l	D		150	UG/L	RBC
MW-13 Dup	06/19/00	8141	Alachlor	2.4	ug/l		NJ	2	UG/L	Fed MCL
MW-13 Dup	06/19/00	6010	Lead	0.099	mg/l			0.015	MG/L	Fed MCL
MW-14	07/06/00	8260	Chlorobenzene	91000	ug/l	D		100	UG/L	Fed MCL
MW-14	07/06/00	8141	Alachlor	220000	ug/l			2	UG/L	Fed MCL
MW-14	07/06/00	6010	Lead	0.029	mg/l			0.015	MG/L	Fed MCL
MW-15	07/18/00	8270	Benzo(a)anthracene	0.89	ug/l	J		0.092	UG/L	RBC
MW-15	07/18/00	8270	Benzo(a)pyrene	1.3	ug/l	J		0.2	UG/L	Fed MCL
MW-15	07/18/00	8270	Benzo(b)fluoranthene	1.4	ug/l	J		0.092	UG/L	RBC
MW-15	07/18/00	8270	Benzo(k)fluoranthene	1.5	ug/l	J		0.92	UG/L	RBC
MW-15	07/18/00	8270	Dibenzo(a,h)anthracene	1.4	ug/l	J		0.0092	UG/L	RBC
MW-15	07/18/00	8270	Indeno-(1,2,3-cd)pyrene	1.3	ug/l	J		0.092	UG/L	RBC
MW-15	07/18/00	8141	Alachlor	8.1	ug/l	P		2	UG/L	Fed MCL
MW-15	07/18/00	6010	Arsenic	0.16	mg/l			0.05	MG/L	Fed MCL
MW-15F	07/18/00	6010	Arsenic	0.072	mg/l			0.05	MG/L	Fed MCL
MW-17	07/21/00	8260	cis/trans-1,2-Dichloroethene	200	ug/l			55	UG/L	RBC
MW-17	07/21/00	8260	Trichloroethene	13	ug/l			5	UG/L	Fed MCL
MW-17	07/21/00	8260	Vinyl chloride	38	ug/l			2	UG/L	Fed MCL
MW-18B	07/20/00	8260	Chloromethane	3.4	ug/l	J		2.1	UG/L	RBC
MW-18B	07/20/00	8270	Benzo(a)pyrene	0.47	ug/l	J		0.2	UG/L	Fed MCL
MW-19	06/30/00	8260	Chlorobenzene	20000	ug/l			100	UG/L	Fed MCL
MW-20	07/21/00	SW9012	Cyanide, Total	1.4	mg/l			0.2	MG/L	Fed MCL
MW-20	07/21/00	6010	Lead	0.033	mg/l			0.015	MG/L	Fed MCL
MW-22	07/17/00	8260	1,2-Dichloroethane	17	ug/l	J		5	UG/L	Fed MCL
MW-22	07/17/00	8260	cis/trans-1,2-Dichloroethene	82	ug/l			55	UG/L	RBC

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
MW-22	07/17/00	8260	Tetrachloroethene	380	ug/l		J	5	UG/L	Fed MCL
MW-22	07/17/00	8260	Trichloroethene	100	ug/l			5	UG/L	Fed MCL
MW-22	07/17/00	8260	Vinyl chloride	3.3	ug/l			2	UG/L	Fed MCL
MW-22	07/17/00	8270	Benzo(a)anthracene	2.3	ug/l	J		0.092	UG/L	RBC
MW-22	07/17/00	8270	Benzo(a)pyrene	1.2	ug/l	J		0.2	UG/L	Fed MCL
MW-22	07/17/00	8270	Benzo(b)fluoranthene	1.5	ug/l	J		0.092	UG/L	RBC
MW-22	07/17/00	8270	Benzo(k)fluoranthene	1.3	ug/l	J		0.92	UG/L	RBC
MW-22	07/17/00	8270	Dibenzo(a,h)anthracene	0.88	ug/l	J		0.0092	UG/L	RBC
MW-22	07/17/00	8270	Indeno-(1,2,3-cd)pyrene	0.92	ug/l	J		0.092	UG/L	RBC
MW-22	07/17/00	8141	Alachlor	7	ug/l			2	UG/L	Fed MCL
MW-23	07/21/00	6010	Lead	0.11	mg/l			0.015	MG/L	Fed MCL
MW-24A	07/24/00	8260	Benzene	83	ug/l			5	UG/L	Fed MCL
MW-24A	07/24/00	8270	Naphthalene	12	ug/l			6.5	UG/L	RBC
MW-24A	07/24/00	8270	2-Chlorophenol	36	ug/l			30	UG/L	RBC
MW-24A	07/24/00	6010	Arsenic	0.35	mg/l			0.05	MG/L	Fed MCL
MW-24AF	07/24/00	6010	Lead	0.017	mg/l			0.015	MG/L	Fed MCL
MW-25A	07/11/00	8260	Benzene	160	ug/l			5	UG/L	Fed MCL
MW-25A	07/11/00	8260	Chlorobenzene	950	ug/l			100	UG/L	Fed MCL
MW-25A	07/11/00	8270	Benzo(a)anthracene	0.82	ug/l	J		0.092	UG/L	RBC
MW-25A	07/11/00	8270	Benzo(a)pyrene	0.71	ug/l	J		0.2	UG/L	Fed MCL
MW-25A	07/11/00	8270	Benzo(b)fluoranthene	0.61	ug/l	J		0.092	UG/L	RBC
MW-25A	07/11/00	8270	Bis(2-ethylhexyl)phthalate	8.7	ug/l	J		6	UG/L	Fed MCL
MW-25A	07/11/00	8270	Indeno-(1,2,3-cd)pyrene	0.61	ug/l	J		0.092	UG/L	RBC
MW-25A	07/11/00	8270	Naphthalene	35	ug/l			6.5	UG/L	RBC
MW-25A	07/11/00	6010	Arsenic	0.31	mg/l			0.05	MG/L	Fed MCL
MW-25A	07/11/00	6010	Barium	5.3	mg/l			2	MG/L	Fed MCL
MW-25A	07/11/00	6010	Beryllium	0.017	mg/l			0.004	MG/L	Fed MCL
MW-25A	07/11/00	6010	Cadmium	0.008	mg/l			0.005	MG/L	Fed MCL
MW-25A	07/11/00	6010	Chromium	0.46	mg/l			0.1	MG/L	Fed MCL
MW-25A	07/11/00	6010	Lead	0.6	mg/l			0.015	MG/L	Fed MCL
MW-25A	07/11/00	6010	Thallium	0.0099	mg/l	B		0.002	MG/L	Fed MCL
MW-25A	07/11/00	6010	Vanadium	0.83	mg/l			0.26	MG/L	RBC
MW-25AF	07/11/00	6010	Arsenic	0.14	mg/l			0.05	MG/L	Fed MCL
MW-26	07/18/00	8270	Benzo(a)anthracene	1.1	ug/l	J		0.092	UG/L	RBC
MW-26	07/18/00	8270	Benzo(a)pyrene	1.4	ug/l	J		0.2	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
MW-26	07/18/00	8270	Benzo(b)fluoranthene	1.6	ug/l	J		0.092	UG/L	RBC
MW-26	07/18/00	8270	Benzo(k)fluoranthene	1.6	ug/l	J		0.92	UG/L	RBC
MW-26	07/18/00	8270	Dibenzo(a,h)anthracene	2.3	ug/l	J		0.0092	UG/L	RBC
MW-26	07/18/00	8270	Indeno-(1,2,3-cd)pyrene	2.1	ug/l	J		0.092	UG/L	RBC
MW-26	07/18/00	6010	Lead	0.04	mg/l			0.015	MG/L	Fed MCL
MW-30A	07/12/00	8270	Benzo(a)anthracene	0.49	ug/l	J		0.092	UG/L	RBC
MW-30A	07/12/00	8270	Benzo(a)pyrene	0.48	ug/l	J		0.2	UG/L	Fed MCL
MW-30A	07/12/00	8270	Benzo(b)fluoranthene	0.31	ug/l	J		0.092	UG/L	RBC
MW-30A	07/12/00	6010	Lead	0.36	mg/l			0.015	MG/L	Fed MCL
Piezometer-1	06/27/00	8260	Chlorobenzene	180	ug/l			100	UG/L	Fed MCL
PZ-FF2	06/20/00	8260	Benzene	140	ug/l	J		5	UG/L	Fed MCL
PZ-FF2	06/20/00	8260	cis/trans-1,2-Dichloroethene	810	ug/l	J		55	UG/L	RBC
PZ-FF2	06/20/00	8260	Toluene	200000	ug/l	D	J	1000	UG/L	Fed MCL
PZ-FF2	06/20/00	8260	Vinyl chloride	740	ug/l			2	UG/L	Fed MCL
PZ-FF3	06/22/00	8260	Benzene	350	ug/l	J		5	UG/L	Fed MCL
PZ-FF3	06/22/00	8260	Chlorobenzene	960	ug/l	J		100	UG/L	Fed MCL
PZ-FF3	06/22/00	8260	cis/trans-1,2-Dichloroethene	1500	ug/l	J		55	UG/L	RBC
PZ-FF3	06/22/00	8260	Toluene	5700000	ug/l	D		1000	UG/L	Fed MCL
PZ-FF3	06/22/00	8260	Trichloroethene	1500	ug/l	J		5	UG/L	Fed MCL
PZ-FF3	06/22/00	8260	Vinyl chloride	1100	ug/l			2	UG/L	Fed MCL
QS-1	07/13/00	8270	Benzo(a)anthracene	0.51	ug/l	J		0.092	UG/L	RBC
QS-1	07/13/00	8270	Bis(2-ethylhexyl)phthalate	8.9	ug/l	J		6	UG/L	Fed MCL
QS-1	07/13/00	6010	Barium	2.6	mg/l			2	MG/L	Fed MCL
QS-1F	07/13/00	6010	Barium	2.4	mg/l			2	MG/L	Fed MCL
REC-1	07/11/00	8260	Chlorobenzene	16000	ug/l			100	UG/L	Fed MCL
REC-1	07/11/00	8260	cis/trans-1,2-Dichloroethene	1300	ug/l			55	UG/L	RBC
REC-1	07/11/00	8260	Methylene chloride	980	ug/l	JB	J	4.1	UG/L	RBC
REC-1	07/11/00	8260	Tetrachloroethene	57000	ug/l			5	UG/L	Fed MCL
REC-1	07/11/00	8260	Trichloroethene	1000	ug/l	J		5	UG/L	Fed MCL
REC-1	07/11/00	8270	Benzo(a)anthracene	1	ug/l	J		0.092	UG/L	RBC
REC-1	07/11/00	8270	Benzo(a)pyrene	0.83	ug/l	J		0.2	UG/L	Fed MCL
REC-1	07/11/00	8270	Benzo(b)fluoranthene	0.76	ug/l	J		0.092	UG/L	RBC
REC-1	07/11/00	8270	Bis(2-ethylhexyl)phthalate	16	ug/l			6	UG/L	Fed MCL
REC-1	07/11/00	8270	Indeno-(1,2,3-cd)pyrene	0.85	ug/l	J		0.092	UG/L	RBC
REC-2	06/28/00	8260	Chlorobenzene	1200	ug/l	J		100	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
REC-2	06/28/00	8260	cis/trans-1,2-Dichloroethene	1500	ug/l			55	UG/L	RBC
REC-2	06/28/00	8260	Methylene chloride	640	ug/l	JB	J	4.1	UG/L	RBC
REC-2	06/28/00	8260	Tetrachloroethene	59000	ug/l			5	UG/L	Fed MCL
REC-2	06/28/00	8260	Trichloroethene	1400	ug/l	J		5	UG/L	Fed MCL
REC-2	06/28/00	8270	Bis(2-ethylhexyl)phthalate	37	ug/l	B	J	6	UG/L	Fed MCL
REC-3	06/28/00	8260	Chlorobenzene	1100	ug/l			100	UG/L	Fed MCL
REC-3	06/28/00	8260	cis/trans-1,2-Dichloroethene	3400	ug/l			55	UG/L	RBC
REC-3	06/28/00	8260	Methylene chloride	230	ug/l	JB	J	4.1	UG/L	RBC
REC-3	06/28/00	8260	Tetrachloroethene	28000	ug/l			5	UG/L	Fed MCL
REC-3	06/28/00	8260	Trichloroethene	3400	ug/l			5	UG/L	Fed MCL
REC-3	06/28/00	8260	Vinyl chloride	130	ug/l			2	UG/L	Fed MCL
REC-3	06/28/00	8270	Bis(2-ethylhexyl)phthalate	90	ug/l	B	J	6	UG/L	Fed MCL
REC-4	06/28/00	8260	Chlorobenzene	200	ug/l	J		100	UG/L	Fed MCL
REC-4	06/28/00	8260	cis/trans-1,2-Dichloroethene	260	ug/l			55	UG/L	RBC
REC-4	06/28/00	8260	Tetrachloroethene	9400	ug/l			5	UG/L	Fed MCL
REC-4	06/28/00	8260	Trichloroethene	1100	ug/l			5	UG/L	Fed MCL
REC-4	06/28/00	8260	Vinyl chloride	26	ug/l			2	UG/L	Fed MCL
REC-4	06/28/00	8270	Bis(2-ethylhexyl)phthalate	13	ug/l	B	J	6	UG/L	Fed MCL
VW-1	07/26/00	8260	Benzene	15000	ug/l	D		5	UG/L	Fed MCL
VW-1	07/26/00	8260	Chlorobenzene	4800	ug/l	D		100	UG/L	Fed MCL
VW-1	07/26/00	8260	Chloromethane	6.8	ug/l	J		2.1	UG/L	RBC
VW-1	07/26/00	8270	Benzo(a)anthracene	1.8	ug/l	J		0.092	UG/L	RBC
VW-1	07/26/00	8270	Benzo(a)pyrene	1.2	ug/l	J		0.2	UG/L	Fed MCL
VW-1	07/26/00	8270	Benzo(b)fluoranthene	1.5	ug/l	J		0.092	UG/L	RBC
VW-1	07/26/00	8270	Benzo(k)fluoranthene	1.8	ug/l	J		0.92	UG/L	RBC
VW-1	07/26/00	8270	Indeno-(1,2,3-cd)pyrene	0.83	ug/l	J		0.092	UG/L	RBC
VW-1	07/26/00	8270	Naphthalene	53	ug/l			6.5	UG/L	RBC
VW-1	07/26/00	6010	Lead	0.37	mg/l		J	0.015	MG/L	Fed MCL
VW-1 Dup	07/26/00	8260	Benzene	15000	ug/l	D		5	UG/L	Fed MCL
VW-1 Dup	07/26/00	8260	Chlorobenzene	4500	ug/l	D		100	UG/L	Fed MCL
VW-1 Dup	07/26/00	8260	Chloromethane	5.5	ug/l	J		2.1	UG/L	RBC
VW-1 Dup	07/26/00	8270	Benzo(a)anthracene	1.4	ug/l	J		0.092	UG/L	RBC
VW-1 Dup	07/26/00	8270	Benzo(a)pyrene	1.1	ug/l	J		0.2	UG/L	Fed MCL
VW-1 Dup	07/26/00	8270	Benzo(b)fluoranthene	0.98	ug/l	J		0.092	UG/L	RBC
VW-1 Dup	07/26/00	8270	Benzo(k)fluoranthene	1.4	ug/l	J		0.92	UG/L	RBC

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Fill and Silt Clay Wells										
VW-1 Dup	07/26/00	8270	Indeno-(1,2,3-cd)pyrene	0.64	ug/l	J		0.092	UG/L	RBC
VW-1 Dup	07/26/00	8270	Naphthalene	47	ug/l			6.5	UG/L	RBC
VW-1 Dup	07/26/00	6010	Lead	0.066	mg/l		J	0.015	MG/L	Fed MCL
VW-2	08/01/00	8260	Benzene	35	ug/l		J	5	UG/L	Fed MCL
VW-2	08/01/00	8260	Chlorobenzene	970	ug/l	D		100	UG/L	Fed MCL
VW-2	08/01/00	8270	Benzo(a)anthracene	2.8	ug/l	J		0.092	UG/L	RBC
VW-2	08/01/00	8270	Benzo(a)pyrene	2.7	ug/l	J		0.2	UG/L	Fed MCL
VW-2	08/01/00	8270	Benzo(b)fluoranthene	2.6	ug/l	J		0.092	UG/L	RBC
VW-2	08/01/00	8270	Benzo(k)fluoranthene	3.2	ug/l	J		0.92	UG/L	RBC
VW-2	08/01/00	8270	Bis(2-ethylhexyl)phthalate	14	ug/l			6	UG/L	Fed MCL
VW-2	08/01/00	8270	Dibenzo(a,h)anthracene	0.97	ug/l	J		0.0092	UG/L	RBC
VW-2	08/01/00	8270	Indeno-(1,2,3-cd)pyrene	2.1	ug/l	J		0.092	UG/L	RBC
VW-2	08/01/00	6010	Antimony	0.057	mg/l			0.006	MG/L	Fed MCL
Sand Wells										
VW-2	08/01/00	6010	Barium	2.7	mg/l			2	MG/L	Fed MCL
VW-2	08/01/00	6010	Lead	0.78	mg/l			0.015	MG/L	Fed MCL
VW-2F	08/01/00	6010	Lead	0.094	mg/l			0.015	MG/L	Fed MCL
HW-1	07/24/00	8260	cis/trans-1,2-Dichloroethene	1700	ug/l	D		55	UG/L	RBC
HW-1	07/24/00	8260	Trichloroethene	74	ug/l			5	UG/L	Fed MCL
HW-1	07/24/00	8260	Vinyl chloride	3.8	ug/l			2	UG/L	Fed MCL
HW-1 Dup	07/24/00	8260	cis/trans-1,2-Dichloroethene	1000	ug/l	D		55	UG/L	RBC
HW-1 Dup	07/24/00	8260	Trichloroethene	44	ug/l			5	UG/L	Fed MCL
HW-1 Dup	07/24/00	8260	Vinyl chloride	2.2	ug/l			2	UG/L	Fed MCL
HW-1B	06/29/00	8260	cis/trans-1,2-Dichloroethene	880	ug/l			55	UG/L	RBC
HW-1B	06/29/00	8260	Tetrachloroethene	38	ug/l			5	UG/L	Fed MCL
HW-1B	06/29/00	8260	Trichloroethene	590	ug/l			5	UG/L	Fed MCL
MW-7A	07/21/00	8260	Benzene	48	ug/l	J		5	UG/L	Fed MCL
MW-7A	07/21/00	8260	Chlorobenzene	3100	ug/l			100	UG/L	Fed MCL
MW-7A	07/21/00	8260	Vinyl chloride	220	ug/l			2	UG/L	Fed MCL
MW-7A	07/21/00	8270	Bis(2-ethylhexyl)phthalate	81	ug/l	B	J	6	UG/L	Fed MCL
MW-7A	07/21/00	8270	Naphthalene	24	ug/l			6.5	UG/L	RBC
MW-7B	07/20/00	8260	Chloromethane	2.6	ug/l	J		2.1	UG/L	RBC
MW-7B	07/20/00	8270	1,4-Dichlorobenzene	270	ug/l			75	UG/L	Fed MCL
MW-7B	07/20/00	8270	Benzo(a)anthracene	0.79	ug/l	J		0.092	UG/L	RBC
MW-7B	07/20/00	8270	Benzo(a)pyrene	0.76	ug/l	J		0.2	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Sand Wells										
MW-7B	07/20/00	8270	Benzo(b)fluoranthene	0.85	ug/l	J		0.092	UG/L	RBC
MW-7B	07/20/00	8270	Benzo(k)fluoranthene	1	ug/l	J		0.92	UG/L	RBC
MW-7B	07/20/00	8270	Bis(2-ethylhexyl)phthalate	13	ug/l	B	J	6	UG/L	Fed MCL
MW-7B	07/20/00	8270	Naphthalene	340	ug/l	D		6.5	UG/L	RBC
MW-7B	07/20/00	8270	p-chloroaniline	650	ug/l	D		150	UG/L	RBC
MW-8A	06/29/00	8260	Benzene	16	ug/l	J		5	UG/L	Fed MCL
MW-8A	06/29/00	8260	Chlorobenzene	3400	ug/l			100	UG/L	Fed MCL
MW-8A	06/29/00	8260	Methylene chloride	58	ug/l	JB	J	4.1	UG/L	RBC
MW-8A	06/29/00	8260	Tetrachloroethene	61	ug/l	J		5	UG/L	Fed MCL
MW-8A	06/29/00	8270	Bis(2-ethylhexyl)phthalate	28	ug/l	B	J	6	UG/L	Fed MCL
MW-8A	06/29/00	8270	Naphthalene	26	ug/l			6.5	UG/L	RBC
MW-8ADUP	06/29/00	8260	Benzene	16	ug/l	J		5	UG/L	Fed MCL
MW-8ADUP	06/29/00	8260	Chlorobenzene	3400	ug/l			100	UG/L	Fed MCL
MW-8ADUP	06/29/00	8260	Tetrachloroethene	72	ug/l	J		5	UG/L	Fed MCL
MW-8ADUP	06/29/00	8270	Bis(2-ethylhexyl)phthalate	22	ug/l	B	J	6	UG/L	Fed MCL
MW-8ADUP	06/29/00	8270	Naphthalene	29	ug/l			6.5	UG/L	RBC
MW-8ADUP	06/29/00	8270	2-Chlorophenol	33	ug/l			30	UG/L	RBC
MW-8ADUP	06/29/00	6010	Thallium	0.0051	mg/l	B		0.002	MG/L	Fed MCL
MW-18A	07/19/00	8260	Benzene	130	ug/l			5	UG/L	Fed MCL
MW-18A	07/19/00	8260	Chlorobenzene	2700	ug/l	B	J	100	UG/L	Fed MCL
MW-18A	07/19/00	8270	Benzo(a)pyrene	0.91	ug/l	J		0.2	UG/L	Fed MCL
MW-18A	07/19/00	8270	Benzo(b)fluoranthene	0.92	ug/l	J		0.092	UG/L	RBC
MW-18A	07/19/00	8270	Benzo(k)fluoranthene	1.1	ug/l	J		0.92	UG/L	RBC
MW-18A	07/19/00	8270	Bis(2-ethylhexyl)phthalate	17	ug/l	B	J	6	UG/L	Fed MCL
MW-18A	07/19/00	8270	Dibenzo(a,h)anthracene	1.8	ug/l	J		0.0092	UG/L	RBC
MW-18A	07/19/00	8270	Indeno-(1,2,3-cd)pyrene	0.61	ug/l	J		0.092	UG/L	RBC
MW-18A	07/19/00	8270	Naphthalene	100	ug/l			6.5	UG/L	RBC
MW-18A	07/19/00	8270	p-chloroaniline	2000	ug/l	D		150	UG/L	RBC
MW-24B	07/11/00	8260	Benzene	6200	ug/l			5	UG/L	Fed MCL
MW-24B	07/11/00	8260	Chlorobenzene	15000	ug/l			100	UG/L	Fed MCL
MW-24B	07/11/00	8260	Methylene chloride	180	ug/l	JB	J	4.1	UG/L	RBC
MW-24B	07/11/00	8270	Benzo(a)anthracene	0.65	ug/l	J		0.092	UG/L	RBC
MW-24B	07/11/00	8270	Benzo(a)pyrene	0.92	ug/l	J		0.2	UG/L	Fed MCL
MW-24B	07/11/00	8270	Benzo(b)fluoranthene	0.71	ug/l	J		0.092	UG/L	RBC
MW-24B	07/11/00	8270	Bis(2-ethylhexyl)phthalate	7.9	ug/l	J		6	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Sand Wells										
MW-24B	07/11/00	8270	Dibenzo(a,h)anthracene	1.1	ug/l	J		0.0092	UG/L	RBC
MW-24B	07/11/00	8270	Indeno-(1,2,3-cd)pyrene	1.3	ug/l	J		0.092	UG/L	RBC
MW-24B	07/11/00	8270	Naphthalene	64	ug/l			6.5	UG/L	RBC
MW-24B	07/11/00	6010	Lead	0.027	mg/l			0.015	MG/L	Fed MCL
MW-25B	07/10/00	8260	Chloroform	2.8	ug/l	J		0.15	UG/L	RBC
MW-25B	07/10/00	8260	Vinyl chloride	14	ug/l			2	UG/L	Fed MCL
MW-25B	07/10/00	6010	Lead	0.027	mg/l			0.015	MG/L	Fed MCL
MW-28B	07/20/00	8260	Chlorobenzene	120	ug/l			100	UG/L	Fed MCL
MW-28B	07/20/00	8260	Chloromethane	2.8	ug/l	J		2.1	UG/L	RBC
MW-28B	07/20/00	8270	Benzo(a)anthracene	1.3	ug/l	J		0.092	UG/L	RBC
MW-28B	07/20/00	8270	Benzo(a)pyrene	1.1	ug/l	J		0.2	UG/L	Fed MCL
MW-28B	07/20/00	8270	Benzo(b)fluoranthene	1	ug/l	J		0.092	UG/L	RBC
MW-28B	07/20/00	8270	Benzo(k)fluoranthene	1.3	ug/l	J		0.92	UG/L	RBC
MW-28B	07/20/00	8270	Indeno-(1,2,3-cd)pyrene	0.8	ug/l	J		0.092	UG/L	RBC
MW-28B	07/20/00	8270	Naphthalene	8.4	ug/l	J		6.5	UG/L	RBC
MW-28B	07/20/00	6010	Arsenic	0.11	mg/l			0.05	MG/L	Fed MCL
MW-28B	07/20/00	6010	Barium	2.2	mg/l			2	MG/L	Fed MCL
MW-28B	07/20/00	6010	Beryllium	0.006	mg/l			0.004	MG/L	Fed MCL
MW-28B	07/20/00	6010	Cadmium	0.01	mg/l			0.005	MG/L	Fed MCL
MW-28B	07/20/00	6010	Chromium	0.57	mg/l			0.1	MG/L	Fed MCL
MW-28B	07/20/00	6010	Lead	0.91	mg/l			0.015	MG/L	Fed MCL
MW-28B	07/20/00	SW7470	Mercury	0.0029	mg/l	SN		0.002	MG/L	Fed MCL
MW-28B	07/20/00	6010	Vanadium	0.3	mg/l			0.26	MG/L	RBC
MW-29	07/12/00	8260	Bromodichloromethane	1.9	ug/l	J		0.17	UG/L	RBC
MW-29	07/12/00	8260	Chlorobenzene	140	ug/l			100	UG/L	Fed MCL
MW-29	07/12/00	8260	Chloroform	6.8	ug/l			0.15	UG/L	RBC
MW-29	07/12/00	8260	Vinyl chloride	6.8	ug/l			2	UG/L	Fed MCL
MW-29	07/12/00	8270	Benzo(a)anthracene	0.38	ug/l	J		0.092	UG/L	RBC
MW-29	07/12/00	8270	Bis(2-ethylhexyl)phthalate	13	ug/l			6	UG/L	Fed MCL
MW-29 DUP	07/12/00	8260	Bromodichloromethane	1.9	ug/l	J		0.17	UG/L	RBC
MW-29 DUP	07/12/00	8260	Chlorobenzene	160	ug/l			100	UG/L	Fed MCL
MW-29 DUP	07/12/00	8260	Chloroform	6.9	ug/l			0.15	UG/L	RBC
MW-29 DUP	07/12/00	8260	Vinyl chloride	7.3	ug/l			2	UG/L	Fed MCL
MW-29 DUP	07/12/00	8270	Benzo(a)anthracene	0.43	ug/l	J		0.092	UG/L	RBC
MW-29 DUP	07/12/00	8270	Benzo(b)fluoranthene	0.33	ug/l	J		0.092	UG/L	RBC

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Sand Wells										
MW-29 DUP	07/12/00	8270	Bis(2-ethylhexyl)phthalate	15	ug/l			6	UG/L	Fed MCL
MW-30B	07/12/00	8260	Benzene	7	ug/l			5	UG/L	Fed MCL
MW-30B	07/12/00	8260	Chlorobenzene	210	ug/l			100	UG/L	Fed MCL
MW-30B	07/12/00	8260	Vinyl chloride	36	ug/l			2	UG/L	Fed MCL
MW-30B	07/12/00	8270	Benzo(a)anthracene	1.1	ug/l	J		0.092	UG/L	RBC
MW-30B	07/12/00	8270	Benzo(a)pyrene	0.83	ug/l	J		0.2	UG/L	Fed MCL
MW-30B	07/12/00	8270	Benzo(b)fluoranthene	0.61	ug/l	J		0.092	UG/L	RBC
MW-30B	07/12/00	8270	Indeno-(1,2,3-cd)pyrene	0.62	ug/l	J		0.092	UG/L	RBC
MW-30B	07/12/00	6010	Arsenic	0.099	mg/l			0.05	MG/L	Fed MCL
MW-30B	07/12/00	6010	Barium	3.1	mg/l			2	MG/L	Fed MCL
MW-30B	07/12/00	6010	Beryllium	0.0087	mg/l			0.004	MG/L	Fed MCL
MW-30B	07/12/00	6010	Cadmium	0.012	mg/l			0.005	MG/L	Fed MCL
MW-30B	07/12/00	6010	Chromium	0.27	mg/l			0.1	MG/L	Fed MCL
MW-30B	07/12/00	6010	Lead	0.67	mg/l			0.015	MG/L	Fed MCL
MW-30B	07/12/00	SW7470	Mercury	0.0076	mg/l			0.002	MG/L	Fed MCL
MW-30B	07/12/00	6010	Vanadium	0.46	mg/l			0.26	MG/L	RBC
OBS-1	07/20/00	8260	Chlorobenzene	500	ug/l	D		100	UG/L	Fed MCL
OBS-1	07/20/00	8260	Tetrachloroethene	5.2	ug/l		J	5	UG/L	Fed MCL
OBS-1	07/20/00	8270	Bis(2-ethylhexyl)phthalate	11	ug/l	B	J	6	UG/L	Fed MCL
OBS-1 DUP	07/20/00	8260	Chlorobenzene	1000	ug/l	D		100	UG/L	Fed MCL
TW-1	07/19/00	8260	Chlorobenzene	130	ug/l	B	J	100	UG/L	Fed MCL
TW-1	07/18/00	8270	Benzo(a)anthracene	0.58	ug/l	J		0.092	UG/L	RBC
TW-1	07/18/00	8270	Benzo(a)pyrene	1.2	ug/l	J		0.2	UG/L	Fed MCL
TW-1	07/18/00	8270	Benzo(b)fluoranthene	0.77	ug/l	J		0.092	UG/L	RBC
TW-1	07/18/00	8270	Benzo(k)fluoranthene	0.94	ug/l	J		0.92	UG/L	RBC
TW-1	07/18/00	8270	Dibenzo(a,h)anthracene	2.1	ug/l	J		0.0092	UG/L	RBC
TW-1	07/18/00	8270	Indeno-(1,2,3-cd)pyrene	1.8	ug/l	J		0.092	UG/L	RBC
VW-2B	07/25/00	8260	cis/trans-1,2-Dichloroethene	230	ug/l			55	UG/L	RBC
VW-2B	07/25/00	8260	Vinyl chloride	21	ug/l			2	UG/L	Fed MCL
VW-2B	07/25/00	8270	Bis(2-ethylhexyl)phthalate	26	ug/l	B	J	6	UG/L	Fed MCL
VW-2B	07/25/00	8270	Dibenzo(a,h)anthracene	2.4	ug/l	J		0.0092	UG/L	RBC
Bedrock Wells										
MW-8R	07/27/00	8270	Bis(2-ethylhexyl)phthalate	26	ug/l			6	UG/L	Fed MCL
MW-13R	07/07/00	8260	Tetrachloroethene	12	ug/l			5	UG/L	Fed MCL
MW-13R	07/07/00	8270	Bis(2-ethylhexyl)phthalate	55	ug/l	B	J	6	UG/L	Fed MCL

TABLE C-1
SUMMARY OF GROUNDWATER SCREENING RESULTS

Sample ID	Sample Date	Method	Analyte	Result	Units	Lab Q	URS Q	Screening Criteria	Screening Unit	Basis
Bedrock Wells										
MW-13R	07/07/00	8141	Alachlor	2.7	ug/l		J	2	UG/L	Fed MCL
MW-21R	07/11/00	8260	Chlorobenzene	140	ug/l			100	UG/L	Fed MCL
MW-21R	07/11/00	8260	Tetrachloroethene	5.2	ug/l			5	UG/L	Fed MCL
OBW-1	06/07/00	8260	Chlorobenzene	4400	ug/l			100	UG/L	Fed MCL
OBW-1	06/07/00	8260	cis/trans-1,2-Dichloroethene	2500	ug/l			55	UG/L	RBC
OBW-1	06/07/00	8260	Tetrachloroethene	92000	ug/l	D		5	UG/L	Fed MCL
OBW-1	06/07/00	8260	Trichloroethene	1500	ug/l			5	UG/L	Fed MCL
OBW-1	06/07/00	8260	Vinyl chloride	140	ug/l			2	UG/L	Fed MCL
OBW-1	06/07/00	8270	Bis(2-ethylhexyl)phthalate	61	ug/l	B	J	6	UG/L	Fed MCL
OBW-1	06/07/00	8270	Nitrobenzene	2100	ug/l	D		3.5	UG/L	RBC
OBW-1	06/07/00	8270	p-chloroaniline	320	ug/l			150	UG/L	RBC
OBW-2	07/07/00	8260	Benzene	67	ug/l			5	UG/L	Fed MCL
OBW-2	07/07/00	8260	Chlorobenzene	15000	ug/l	D		100	UG/L	Fed MCL
OBW-2	07/07/00	8260	cis/trans-1,2-Dichloroethene	3700	ug/l			55	UG/L	RBC
OBW-2	07/07/00	8260	Tetrachloroethene	120000	ug/l	D		5	UG/L	Fed MCL
OBW-2	07/07/00	8260	Toluene	1400	ug/l			1000	UG/L	Fed MCL
OBW-2	07/07/00	8260	Trichloroethene	4100	ug/l	D	J	5	UG/L	Fed MCL
OBW-2	07/07/00	8260	Vinyl chloride	45	ug/l			2	UG/L	Fed MCL
OBW-2	07/07/00	8270	Bis(2-ethylhexyl)phthalate	31	ug/l	B	J	6	UG/L	Fed MCL
OBW-2	07/07/00	8270	p-chloroaniline	300	ug/l			150	UG/L	RBC
OBW-3	07/06/00	8260	Benzene	67	ug/l			5	UG/L	Fed MCL
OBW-3	07/06/00	8260	Chlorobenzene	2900	ug/l	D	J	100	UG/L	Fed MCL
OBW-3	07/06/00	8260	Trichloroethene	39	ug/l			5	UG/L	Fed MCL

Notes:
Modified from Table 4-4 from the RCRA Facility Investigation Data Gap Investigation Report (URS, July 2002)
Fed MCLs = Federal Maximum Contaminant Levels (accessed from the internet March 2001)
RBC = USEPA Region 3 Risk Based Concentrations (RBCs) for Tap Water (October 2000)
An "F" in the Sample ID (e.g., MW-20F) indicates a filtered sample.
Q = qualifier
ug/l = micrograms per liter
mg/l = milligrams per liter

TABLE C-1

SUMMARY OF GROUNDWATER SCREENING RESULTS

URS QUALIFIERS	
QUALIFIER	**DEFINITIONS[1]**
J	The associated value is an estimated quantity
N	Presumptive evidence of presence. Analyte may or may not be present.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
LABORATORY QUALIFIERS	
QUALIFIER	**INORGANIC QUALIFIER DEFINITIONS**
B	This flag indicates the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
N	This flag indicates that spiked sample recovery is not within control limits.
S	This flag indicates that the reported value was determined by the Method of Standard Additions (MSA).
QUALIFIER	**ORGANIC QUALIFIER DEFINITIONS**
B	This flag is used when the analyte if found in the associated method blank as well as in the sample.
D	If a sample or extract is reanalyzed at a higher dilution factor, the DL suffix is appended to the sample number of the Form I for the more diluted sample, and all reported concentrations on that Form I are flagged with the D flag.
J	This flag indicates an estimated value. This flag is used (1) when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the results is less than the CRQL but greater than zero, and (3) when the retention time data indicate the presence of a compound that meets the pesticide/Aroclor identification criteria, and the result is less than the CRQL but greater than zero.
N	This flag indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds (TICs), where the identification is based on a mass spectral library search.
P	This flag is used for pesticide/Aroclor target analyte when there is greater than 35% difference for detected concentrations between the two GC columns.

[1] USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.

Table C-2
COPCs and Screening Criteria
Former Acetanilides Production Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Alachlor	2.2	0.038	0.38	2/6	81	72	---	0.05
Benzo(a)anthracene	0.9	0.38	0.64	2/2	4	7.8	2	0.2
Benzo(a)pyrene	1.1	0.5	0.8	2/2	0.6	0.78	8	24
Benzo(b)fluoranthene	0.72	0.48	0.6	2/2	4	7.8	5	0.6
Benzo(k)fluoranthene	0.97	0.42	0.7	2/2	32	78	49	0.6
Chlorobenzene	59	0.0071	6.10	5/12	180	41000	1	2.8
Chrysene	0.98	0.44	0.71	2/2	140	780	160	0.2
Arsenic	7.5	4.8	6.2	2/2	14	3.8	29	---
Beryllium	0.45	0.34	0.4	2/2	0.2	4100	63	130
Mercury	7.6	0.13	3.9	2/2	1	---	2	3.2
SOIL (0-10')	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Alachlor	80	0.0085	4.04	15/31	81	72	---	0.05
Benzo(a)anthracene	0.9	0.38	0.49	2/3	4	7.8	2	0.2
Benzo(a)pyrene	1.1	0.5	0.6	2/3	0.6	0.78	8	24
Benzo(k)fluoranthene	0.97	0.42	0.53	2/3	32	78	49	0.6
Chlorobenzene	59	0.0071	3.19	14/33	180	41000	1	2.8
Chrysene	0.98	0.44	0.54	2/3	140	780	160	0.2
Tetrachloroethene	225.3	0.0063	6.91	4/34	120	110	0.06	0.1
Trichloroethene	0.94	0.0089	0.31	2/33	89	14	0.06	0.1
Arsenic	7.5	4.8	5	3/3	14	3.8	29	---
Beryllium	0.45	0.35	0.36	2/3	0.2	4100	63	130
Mercury	76	0.046	2.59	3/3	1	---	2	3.2
ALL SOIL DEPTHS	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Alachlor	80	0.0085	4.44	15/31	81	72	---	0.05
Benzo(a)anthracene	0.9	0.38	0.49	2/3	4	7.8	2	0.2
Benzo(a)pyrene	1.1	0.5	0.6	2/3	0.6	0.78	8	24
Benzo(b)fluoranthene	0.72	0.48	0.46	2/3	4	7.8	5	0.6
Benzo(k)fluoranthene	0.97	0.42	0.53	2/3	32	78	49	0.6
Chlorobenzene	59	0.0071	3.19	14/33	180	41000	1	2.8
Tetrachloroethene	225.3	0.0063	6.91	4/34	120	110	0.06	0.1
Trichloroethene	0.94	0.0089	0.31	2/33	89	14	0.06	0.1
Arsenic	7.5	4.8	5	3/3	14	3.8	29	---
Beryllium	0.45	0.35	0.36	2/3	0.2	4100	63	130
Mercury	7.6	0.046	2.59	3/3	1	---	2	3.2

Notes:
Modified from Table 2-1 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-3
COPCs and Screening Criteria
Boiler Slag Accumulation Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor-1248	89	89	NA	1/1	2.5	2.9	---	18
Aroclor-1254	46	46	NA	1/1	2.5	2.9	---	18
Arsenic	6.5	6.5	NA	1/1	14	3.8	29	---
Beryllium	0.7	0.7	NA	1/1	0.2	4100	63	130
ALL SOIL DEPTHS								
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor-1248	460	5.3	78	7/9	2.5	2.9	---	18
Aroclor-1254	46	46	NA	1/9	2.5	2.9	---	18
Aroclor-1260	260	0.21	34	7/9	2.5	2.9	---	18
Polychlorinated Biphenyls	23.6	5.6	3.0	3/14	2.5	2.9	---	18
Arsenic	9.3	4.4	6.9	9/9	14	3.8	29	---
Beryllium	0.95	0.70	0.62	5/9	0.2	4100	63	130

Notes:
Modified from Table 2-2 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-4
COPCs and Screening Criteria
Bulk Chemical Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
Organics	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	6.1	0.49	3.3	2/2	4	7.8	2	0.2
Benzo(a)pyrene	4	0.39	2.2	2/2	0.6	0.78	8	24
Benzo(b)fluoranthene	4.6	0.36	2.5	2/2	4	7.8	5	0.6
Benzo(k)fluoranthene	2.3	0.3	1.3	2/2	32	78	49	0.6
Chrysene	4.3	0.54	2.4	2/2	140	780	160	0.2
SURFACE SOIL (0-2')								
Inorganics	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	11	7.3	9.2	2/2	300	820	5	---
Arsenic	42	34	38	2/2	---	3.8	29	---
Beryllium	1.2	0.91	1.1	2/2	0.2	4100	63	130
Chromium	270	45	158	2/2	4500	6100	38	38
Lead	1100	830	960	2/2	660	---	---	---
Thallium	1.2	1.2	NA	1/2	61	140	0.7	2.8
SOIL (0-10')								
Organics	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Chlorobenzene	1500	0.015	160	8/24	180	41000	1	2.8
Benzo(a)anthracene	150	0.49	13.6	13/24	4	7.8	2	0.2
Benzo(a)pyrene	88	0.39	9.3	14/24	0.6	0.78	8	24
Benzo(b)fluoranthene	100	0.36	11	14/24	4	7.8	5	0.6
Benzo(k)fluoranthene	47	0.3	5.9	12/24	32	78	49	0.6
Chrysene	110	0.44	11	14/24	140	780	160	0.2
Indeno-(1,2,3-cd)pyrene	35	0.25	5.1	13/24	11	7.8	14	1.8
Naphthalene	250	0.95	15	4/24	240	41000	84	24
Nitrobenzene	0.62	0.62	NA	1/24	35	1000	0.1	0.2
SOIL (0-10')								
Inorganics	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	45	6.4	7.0	7/24	300	820	5	---
Arsenic	42	4	12	24/24	14	3.8	29	---
Barium	3400	73	720	24/24	51000	140000	1600	1700
Beryllium	3.1	0.59	1.1	16/24	0.2	4100	63	130
Cadmium	11	0.75	3.7	22/24	380	1000	8	11
Chromium	270	6.8	33	24/24	4500	6100	38	38
Lead	6000	14	860	24/24	660	---	---	---
Thallium	6.6	1.2	0.93	2/24	61	140	0.7	2.8
ALL SOIL (0'-water table)								
Organics	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Chlorobenzene	1500	0.015	174	10/26	180	41000	1	2.8
Benzo(a)anthracene	150	0.49	13	13/26	4	7.8	2	0.2
Benzo(a)pyrene	88	0.038	8.9	15/26	0.6	0.78	8	24
Benzo(b)fluoranthene	100	0.36	10	14/26	4	7.8	5	0.6
Benzo(k)fluoranthene	47	0.3	5.8	12/26	32	78	49	0.6
Chrysene	110	0.44	10	14/26	140	780	160	0.2
Indeno-(1,2,3-cd)pyrene	35	0.25	5.0	13/26	11	7.8	14	1.8
Naphthalene	250	0.03	15	6/26	240	41000	84	24
Nitrobenzene	0.62	0.62	NA	1/26	35	1000	0.1	0.2

Table C-4
COPCs and Screening Criteria
Bulk Chemical Area

ALL SOIL (0'-water table) Inorganics	Maximum (mg/kg)	Minimum (mg/kg)	Arithmetic Mean (mg/kg)	Frequency (mg/kg)	CALM value for Industrial Soil (Scenario C) (mg/kg)	Region III RBC for Industrial Soil (mg/kg)	USEPA SSL - 20 DAF (mg/kg)	CALM Leaching to Groundwater (mg/kg)
Antimony	45	6.4	6.6	7/26	300	820	5	---
Arsenic	42	2.8	12	26/26	14	3.8	29	---
Barium	3400	62	690	26/26	51000	140000	1600	1700
Beryllium	3.1	0.18	1.1	18/26	0.2	4100	63	130
Cadmium	11	0.75	3.7	23/26	380	1000	8	11
Chromium	270	5	31	26/26	4500	6100	38	38
Lead	6000	8.1	840	26/26	660	---	---	---
Mercury	1.5	0.37	0.66	5/6	1	---	2	3.2
Thallium	6.6	1.2	0.91	2/26	61	140	0.7	2.8

Notes:
Modified from Table 2-2 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-5
COPCs and Screening Criteria
Former Coal Storage Yard

Chemical	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
Organics (mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Tetrachloroethene	0.26	0.26	NA	1/3	120	110	0.06	0.1
SUBSURFACE SOIL (0-10')								
Organics (mg/kg)								
Tetrachloroethene	0.26	0.26	NA	1/4	120	110	0.06	0.1
ALL SOIL (0'-water table)								
Organics (mg/kg)								
Tetrachloroethene	0.26	0.26	NA	1/6	120	110	0.06	0.1

Notes:
Modified from Table 2-4 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-6
COPCs and Screening Criteria and Selection of COPCs
FF Building Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Tetrachloroethene	2000	0.11	200	4/10	120	110	0.06	0.1
Trichloroethene	1	1	NA	1/10	89	14	0.06	0.1
SOIL (0-10')								
	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Tetrachloroethene	2000	0.028	172	15/27	120	110	0.06	0.1
Trichloroethene	21	0.039	2.4	4/23	89	14	0.06	0.1
ALL SOIL DEPTHS								
	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Tetrachloroethene	2000	0.0089	155	18/30	120	110	0.06	0.1
Trichloroethene	21	0.039	2.1	4/26	89	14	0.06	0.1

Notes:
Modified from Table 2-5 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-7
COPCs and Screening Criteria
Former Quarry Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
Organics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Alachlor	0.63	0.028	0.33	2/2	81	72	---	0.05
Benzo(a)anthracene	2	0.35	3.1	2/4	4	7.8	2	0.2
Benzo(a)pyrene	0.9	0.54	2.8	2/4	0.6	0.78	8	24
Benzo(b)fluoranthene	1.4	0.34	2.9	2/4	4	7.8	5	0.6
Benzo(k)fluoranthene	0.99	0.37	2.8	2/4	32	78	49	0.6
Chrysene	1.8	0.48	3.0	2/4	140	780	160	0.2
SURFACE SOIL (0-2')								
Inorganics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	12	4.5	9.1	4/4	14	3.8	29	---
Beryllium	0.56	0.32	0.43	3/4	0.2	4100	63	130
SOIL (0-10')								
Organics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	23	0.26	3.3	12/19	4	7.8	2	0.2
Benzo(a)pyrene	17	0.3	2.9	12/19	0.6	0.78	8	24
Benzo(b)fluoranthene	22	0.26	3.3	15/19	4	7.8	5	0.6
Benzo(k)fluoranthene	1.1	0.22	1.8	8/19	32	78	49	0.6
Chrysene	20	0.27	3.0	12/19	140	780	160	0.2
p-chloroaniline	8.2	0.071	3.5	3/19	920	8200	0.7	---
SOIL (0-10')								
Inorganics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	33	2.6	9.7	17/17	---	3.8	29	---
Barium	3600	120	440	17/17	51000	140000	1600	1700
Beryllium	0.63	0.32	0.38	8/17	0.2	4100	63	130
ALL SOIL								
Organics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Alachlor	2.9	0.028	0.45	4/8	81	72	---	0.05
Benzo(a)anthracene	23	0.26	3.0	16/24	4	7.8	2	0.2
Benzo(a)pyrene	17	0.3	2.6	16/24	0.6	0.78	8	24
Benzo(b)fluoranthene	22	0.26	3.2	19/24	4	7.8	5	0.6
Benzo(k)fluoranthene	1.1	0.22	1.5	9/24	32	78	49	0.6
Chrysene	20	0.27	2.8	16/24	140	780	160	0.2
Indeno-(1,2,3-cd)pyrene	2.6	0.17	1.5	10/24	11	7.8	14	1.8
p-chloroaniline	8.3	0.071	3.3	4/24	920	8200	0.7	---
ALL SOIL								
Inorganics (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	33	2.6	9.6	21/21	14	3.8	29	---
Barium	3600	120	390	21/21	51000	140000	1600	1700
Beryllium	0.63	0.32	0.37	8/21	0.2	4100	63	130

Notes:
Modified from Table 2-6 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-8
COPCs and Screening Criteria
VV Building Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2') (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Polychlorinated biphenyls	75.3	7.2	44	3/3	2.5	2.9	---	18
ALL SOIL DEPTHS (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor-1242	3400	0.25	730	4/5	2.5	2.9	---	18
Aroclor-1260	21	21	NA	1/5	2.5	2.9	---	18
Polychlorinated biphenyls	198.5	1.1	35	21/33	2.5	2.9	---	18

Notes:
Modified from Table 2-7 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-9
COPCs and Screening Criteria
WW Building Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2')								
(mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor-1254	3.1	3.1	NA	1/3	2.5	2.9	---	18
ALL SOIL DEPTHS								
(mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor-1254	3.1	0.26	0.49	2/7	2.5	2.9	---	18

Notes:
Modified from Table 2-8 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-10
COPCs and Screening Criteria
KK Building Area

	Maximum	Minimum	Arithmetic Mean	Frequency	CALM value for Industrial Soil (Scenario C)	Region III RBC for Industrial Soil	USEPA SSL - 20 DAF	CALM Leaching to Groundwater
SURFACE SOIL (0-2') ORGANICS (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	20	0.18	10	2/2	4	7.8	2	0.2
Benzo(a)pyrene	19	0.2	9.6	2/2	0.6	0.78	8	24
Benzo(b)fluoranthene	17	0.18	8.6	2/2	4	7.8	5	0.6
Benzo(k)fluoranthene	18	0.19	9.1	2/2	32	78	49	0.6
Chrysene	15	0.2	7.6	2/2	140	780	160	0.2
Dibenzo(a,h)anthracene	4.6	4.6	NA	1/2	0.6	0.78	2	2
Indeno-(1,2,3-cd)pyrene	12	0.12	6.1	2/2	11	7.8	14	1.8
SURFACE SOIL (0-2') INORGANICS (mg/kg)								
Arsenic	12	8.3	10	2/2	14	3.8	29	---
Beryllium	1.1	0.25	0.68	2/2	0.2	4100	63	130
SOIL (0-10') ORGANICS (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	20	0.18	10	2/2	4	7.8	2	0.2
Benzo(a)pyrene	19	0.2	9.6	2/2	0.6	0.78	8	24
Benzo(b)fluoranthene	17	0.18	8.6	2/2	4	7.8	5	0.6
Benzo(k)fluoranthene	18	0.19	9.1	2/2	32	78	49	0.6
Chlorobenzene	29	0.01	8.5	5/8	180	41000	1	2.8
Chrysene	15	0.2	7.6	2/2	140	780	160	0.2
Dibenzo(a,h)anthracene	4.6	4.6	NA	1/2	0.6	0.78	2	2
Indeno-(1,2,3-cd)pyrene	12	0.12	6.1	2/2	11	7.8	14	1.8
Xylene	530	180	90	2/8	418	4100000	29	16
SOIL (0-10') INORGANICS (mg/kg)								
Arsenic	12	8.3	10	2/2	14	3.8	29	---
Beryllium	1.1	0.25	0.68	2/2	0.2	4100	63	130
ALL SOIL DEPTHS ORGANICS (mg/kg)					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzo(a)anthracene	20	0.18	10	2/2	4	7.8	2	0.2
Benzo(a)pyrene	19	0.2	9.6	2/2	0.6	0.78	8	24
Benzo(b)fluoranthene	17	0.18	8.6	2/2	4	7.8	5	0.6
Benzo(k)fluoranthene	18	0.19	9.1	2/2	32	78	49	0.6
Chlorobenzene	29	0.088	6.80	7/10	180	41000	1	2.8
Chrysene	15	0.2	7.60	2/2	140	780	160	0.2
Dibenzo(a,h)anthracene	4.6	4.6	NA	1/2	0.6	0.78	2	2
Indeno-(1,2,3-cd)pyrene	12	0.12	6.1	2/2	11	7.8	14	1.8
Xylene	530	0.0066	72	3/10	418	4100000	29	16
ALL SOIL DEPTHS INORGANICS (mg/kg)								
Arsenic	12	8.3	10	2/2	14	3.8	29	---
Beryllium	1.1	0.25	0.68	2/2	0.2	4100	63	130

Notes:
Modified from Table 2-9 from the Human Health Risk Assessment (URS, July 2002)
CALM Contact = Cleanup Levels for Missouri (CALM) Tier 1 values for Scenario C (industrial) Soil Target Concentrations (STARC) and leaching to groundwater values (September 2001)
RBC Indust = USEPA Region 3 Risk-Based Concentrations (RBCs) for Industrial Exposure (October 2000)
SSL 20 DAF = USEPA Soil Screening Levels (SSLs) for transfer from soil to groundwater (October 2000)

Table C-11
Volatile Organic Compounds COPCs in Surface Water and Screening Criteria

Parameter	Units	Southern Section	Northern Section	Human Health	
				Water and Organisms	Organisms Only
Groundwater Flow	cfs[1]	0.9	0.8		
Chlorobenzene	mg/L	0.526	0.268	**0.68**	**21**
Benzene	mg/L	0.013	0.0001	**0.0012**	**0.071**
Xylene	mg/L	0.001	0.004		
1,4-Dichlorobenzene	mg/L	---	0.0001	**0.4**	**2.6**

Modified from table on Page 4-8 from the RCRA Facility Investigation Data Gap Investigation Report (URS, July 2002)
Human health criteria from "National Recommended Water Quality Criteria-Correction" (USEPA, April 1999)
cfs[1]=denotes cubic feet per second

APPENDIX D

Purpose

This procedure describes a process for managing changes to plant processes, equipment, or facilities. The process assures that, before implementation:

- Changes are adequately reviewed and approved, considering the
  - Technical basis for the change, and
  - Potential impact on safety, health, or the environment,
- Documentation is updated, and
- Appropriate training is completed.

If changes are managed following this procedure, compliance with the management of change section of OSHA 1910.119 (l), Process Safety Management is assured.

Scope

Any change in policy, equipment, facilities, materials, staffing, or work processes which could affect our safety, health, or environment shall be tested via the decision tree in Appendix A to determine if this management of change process should be applied.

Any process amendment used for any change which involves widening or removing operating limits on an independent process variable as listed in Document 4, Appendix A of the Standard Manufacturing Process requires the execution of a Management of Change.

Exceptions

These changes are not included in the scope:

- Like-for-like replacements of equipment or parts do not initiate MOC.
- Capital projects are reviewed following a PHA process described in Plant Procedure 716, "Process Hazard Analyses". Changes which occur as a result of capital projects are exempted from this procedure.
- Changes which could affect product quality or customer service are effectively reviewed in other change processes.

Comments on the relationship between the MOC and the Document Control procedures:

- Changes covered by MOC usually cause a need to update plant controlled documents, and the reverse could also be true, i.e. a planned change to a controlled document, when tested through the decision tree in Appendix A, might sometimes trigger MOC.
- When updates to controlled documents are required, those changes

follow a separate change management process, which is described in Plant Procedure Q111, "Document Control".

- For covered changes, the two change processes (Procedures 709 and Q111) normally operate concurrently, and both should be completed prior to start-up.

Contents

This procedure covers the following topics.

Attachments

The following are attached.

Attachment	Title
Appendix A	MOC Decision Tree
Form 709-1	Change Request Form
Form 709-2	Training Documentation Form

References

The following references are important.

Reference	Title
Plant Procedure Q111	"Document Control- Information Management"
Plant Procedure 716	"Process Hazard Analysis"
Plant Procedure Q473	"Process Amendments"
Solutia ESH Commitment 4.2.05	"Management of Change"
29 CFR 1910.119 (l)	"Process Safety Management"

Definitions

The following definition is given.

Term	Definition
Significant Risk	Risk of: • Experiencing an OSHA Recordable Injury, • Equipment sustaining an S&PP Reportable Loss (>$25k). • An environmental incident as a Solutia Reportable,

The MOC Process

The MOC is executed as follows, using the Change Request form as a guide through the steps.

Submit Change Request

For planned changes within the scope of this procedure, the Change Owner will consult the decision tree in Appendix A to determine if MOC must be executed. S/he may consult the Process Safety Specialist if unclear.

For changes requiring MOC, the Change Owner completes the "Submit" section of the Change Request Form (Attachment 1).

The Change Owner should assign a change number, using a format such as "Dept-YY-NNN". Departments can construct these numbers as desired, so long as each change request is uniquely numbered.

Examples: "Dura-98-001", "Lasp-98-047", "Mal-98-011".

Classify Change

The Change Owner checks the appropriate box on the form to classify the change as:

- Technology/Process
- Equipment/Facility
- Organization

Evaluate Consequences

On this section of the Change Request form the Change Owner indicates the status of the Process Hazard Analysis (PHA) for this change.

A PHA, following Plant Procedure 716, shall be conducted for all changes covered by this procedure. The PHA may be in the form of:

- A checklist, such as the one found in plant procedure 716, or
- A safety review.

The Change Owner documents the PHA by describing the review process on the comment section of change request form, or by attaching the checklist or meeting minutes to the change request form.

Additionally, any reviewers should initial the request form and any significant comments should be noted.

The Change owner may logically need to review this change with several people. As s/he does so, s/he gets reviewers to initial the review boxes under the "Evaluate" section of the Change Request.

Approve Change

The Change Owner obtains approval for the change. The approval level may vary depending on the type of change. See the table below for minimum requirement approval levels.

The Approver is accountable to assess the planned change and the completed review process, including the PHA, to assure that the requirements of this procedure are met. S/he may request additional reviews if necessary prior to approval.

To authorize a change, the Approver signs the request form and returns it to the Change Owner. If the change is not approved, the Change Owner sends the Change request to the MOC Document Coordinator for filing. If approved, execute the change.

Type Of Change	Approval Level
Process Equipment/Facility	Business Team Leader
Site Facility	Queeny Site Leader
Process	Business Team Leader
Interlock By-pass/Change (Class 1 or 2)	Plant Manager
Organization	Queeny Site Leader

Execute Change

After approval, the Change Owner begins execution of the planned change.

- The Change Owner is accountable for revising any affected documents

following Plant Procedure Q111, "Document Control", and listing the revised documents on the request form.

- The Change Owner is accountable for conducting appropriate training. Appropriate training could consist of face to face instruction, or informing affected persons via memo or e-mail.

  Use face-to-face training whenever simple notification by memo or e-mail might create a "significant risk" (see Definitions).

  Document any face to face training using the form in Attachment 2, and attach the form to the Change Request form.

  If the change requires only that affected persons be informed, document the communication by attaching a copy of the memo or e-mail which informed them.

Pre Start-Up Review

A pre-startup review **shall** be conducted for all new facilities, and modifications to existing facilities, involving new equipment or operations outside the previously approved Standard Manufacturing Process (SMP).

The Change Owner will arrange and lead the pre-startup review to ensure:

- The change was constructed as intended,
- Documentation is revised and issued,
- Training (face-to-face instruction or communication) is complete.

The pre-start-up review should include representatives from the involved department, environmental, safety, health, and quality as judged appropriate.

The pre-startup review **may be waived** with the approval of the Process and Personal Safety Specialist and/or the ESH Coordinator.

The Change Owner will indicate the date of the pre-start-up review on the Change Request, and the attendees will initial the form.

The waiver approval date and signature shall also be included on the Change Request, as appropriate.

Approval To Start-up

Approval to start-up is the same as given in the table on page 4. The Approver is accountable to assure that all steps, including pre-start-up review, have been executed successfully.

When approval is given, the change may start up.

Record Retention

The Change Owner routes the completed Change Request to the MOC Document Coordinator.

Closed request forms shall be retained for five years after closure.

The MOC Document Coordinator posts the completed Change Request forms and attachments on JFQ Docs for the current year.

Document History and Approvals

Revision History

Recent revisions include.

Date	Text Affected
11/98	Major revision to adopt the Krummrich MOC process. Changes include: • Clarifying that controlled document changes may result from MOC, but are covered separately under Plant Procedure Q111. • Removal from the scope of this procedure all changes resulting from capital projects. • Removed from the scope changes which only affect energy usage or quality. • Addition of a decision tree (Appendix A) to make it easier to determine whether a change initiates MOC. • Assignment of an MOC Documentation Specialist to file completed Change Request forms. • Simplifying the definition of the type of changes covered, and instead relying more on the judgment of the Change Owner. • Modification of the Change Request and Training Documentation forms to reflect the new process. • Posting the completed Change Request documentation on JFQ Docs for the current year. • Required retention of the MOC forms or paper for 5 years.
7/99	Added reference to OSHA PSM standard and S&PP Procedure No. 18 to list of references. Added further clarification as to the types of changes requiring a pre-startup review in the "Execute Change" section. Added the ability to request a waiver of pre-startup review and included

Date	Text Affected
	the waiver information of Form 709-1.
6/00	Added process amendment requirement to scope section to be consistent with Plant Procedure Q473, "Process Amendments." Added Plant Procedure Q473 to list of references. Removed reference to S&PP Procedure No. 18, "Project Safety and Loss Prevention Review" and added reference to Solutia ESH Commitment 4.2.05, "Management of Change." Separated out the pre-start-up review requirements to add emphasis. Modified Form 709-1 to provide added emphasis to the need for either a pre-start-up review or a pre-start-up review waiver. Changed Plant Manager approval from Jim Hart to Robin Prokop.
5/01	Deleted a reference which seemed to say organization changes were covered adequately by the process described in Q100, "Organization". In fact, Q100 simply referred back to this procedure, making a circular reference. This procedure now more clearly includes staffing changes in it's scope. Added "Organization" to the types of changes on the MOC form, and listed organization changes on the approval table as requiring Queeny Site Leader approval.

Reviews and Approvals

Author: QA Coordinator, Micky Boles — Date

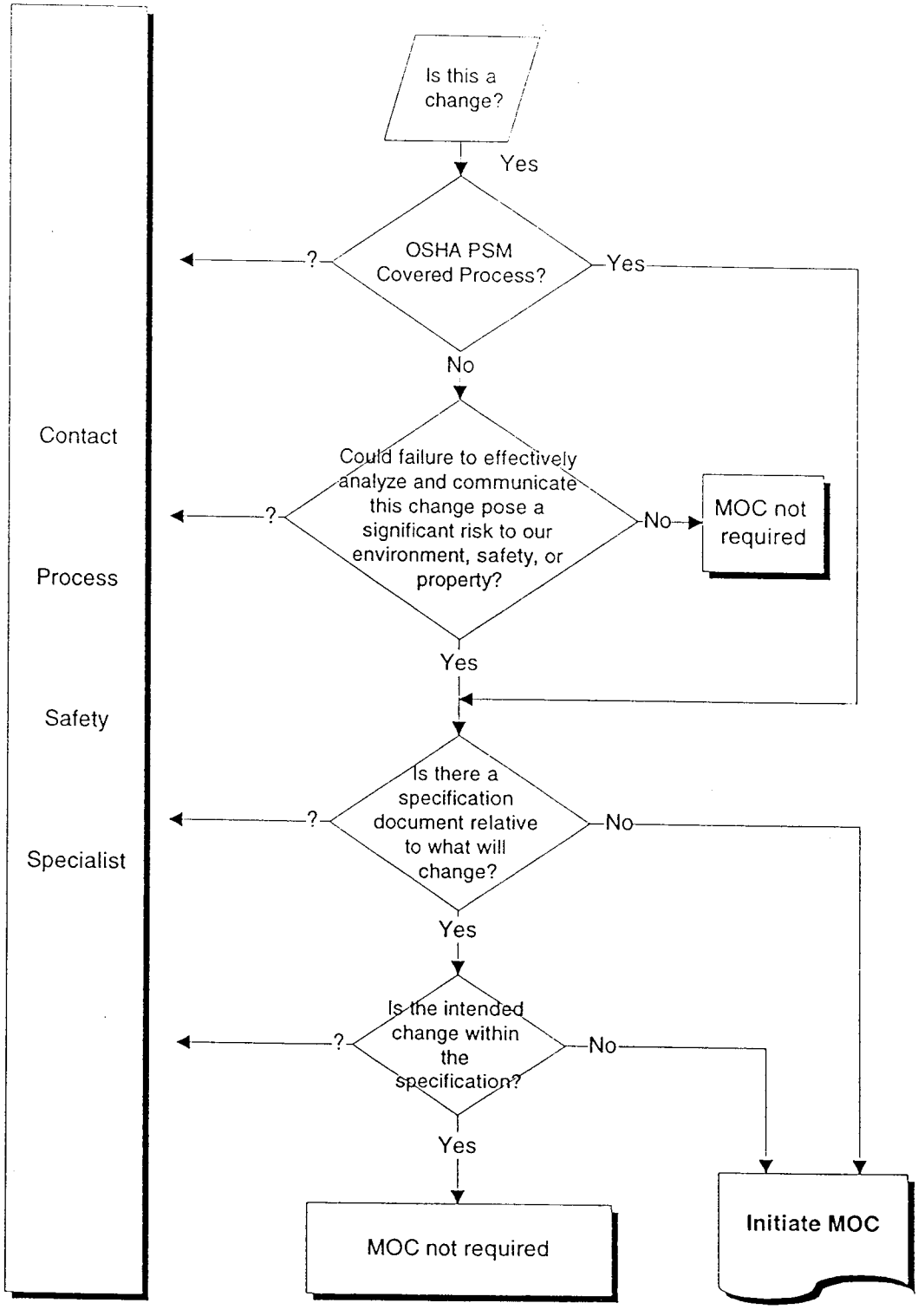
Review: ESH Coordinator, Bob Cheever

Review: Safety Specialist, Mark Peal — Date

Review: Queeny Site Leader, Brad Young — Date

Approval: Plant Manager, Robin K. Prokop — Date

Appendix A: MOC Decision Tree



Change Request Form

Change Request Number:_____

Submit

Submitted By:	Date:	Department:

Affected Equipment (Item #):

Description And Reason For Change:

Classify

Which Category(s) Describes The Type Of Change?

☐ Technology/Process ☐ Equipment/Facilities ☐ Organization

Evaluate

Has A Hazard Analysis Been Completed? ☐ Yes Analysis Method? ☐ Checklist ☐ Other (Comment Or Document)

Comments:

Who Has Reviewed The Change Request? Please Initial.

☐ Safety	☐ Provox Engineer	☐ E&I	☐ Document Owner	☐ Materials Engr.
☐ Environmental	☐ Process Engineer	☐ Mechanical	☐ Trainer/Coordinator	☐ Research
☐ Industrial Hygiene	☐ Production Engineer	☐ Operations	☐ QA Coordinator	☐ Other _____

Comments:

Approve

Approved By:

If approval is denied, please explain.

Prepare & Execute

List Affected Documents:

Have Affected Documents Been Revised And Issued Prior To Execution? ☐ Yes ☐ N/A

Have Affected Employees Been Informed/Trained Prior To Execution? ☐ Yes Execution Date:_____

Method Used: ☐ Face To Face Instruction, or ☐ Communications

Pre Start-Up Review

Date of pre-start-up review _____. Attendees initial below.

Date of pre-startup review waiver _____. Approved By: _____

☐ Safety	☐ Provox Engineer	☐ E&I	☐ Document Owner	☐ Materials Engr.
☐ Environmental	☐ Process Engineer	☐ Mechanical	☐ Trainer/Coordinator	☐ Research
☐ Industrial Hygiene	☐ Production Engineer	☐ Operations	☐ QA Coordinator	☐ Other _____

Approval to start up. _____ **Date**_____

Form 709-1 Revised 6/00

MOC Training Documentation Form

Training Subject:	
Change Request Number:	
Type of Training:	Face to Face Instruction Communication
Instructor (if applicable):	

For face to face instruction, attendees must sign and date below as acknowledgment that the change is understood.

Clock Number	Name (Print)	Signature	Department

Form 709-2 Revised 10/98

Purpose

To define the requirements for excavation

Policy

An approved Excavation Permit is required prior to all excavations at the J. F. Queeny Plant and Rhodia's St. Louis Analgesics Plant.

Excavations greater than four feet in depth may be confined spaces and must also follow Plant Procedure 786, "Confined Space Entry."

Each Excavation Permit Initiator has overall accountability for compliance with this procedure.

Scope

This procedure is applicable to actions of Solutia, Rhodia and outside contractor personnel.

References

The following references are important:

- 29 CFR 1926, OSHA, Subpart P, "Excavations," 10/31/89, owner: Safety and Health Technician.
- Plant Procedure 786, "Confined Space Entry."

Attachments

Form Q-696, Revised 2/95, "Excavation Permit," two pages (front and back).

Definitions

The following definitions are given:

Term	Definition
Competent Person	Per OSHA, one "capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them." Note that a registered, professional engineer is required to approve designs of "manufactured protective systems," "tabulating data," or approving excavation work below the base or footing of any nearby foundation or retaining wall without a support system.
Excavation	Any removal of soil from the ground.

Procedure

Complete the Excavation Permit

The steps for completing an Excavation Permit are:

Step	Action
1	The permit initiator, usually a member of maintenance supervision or engineering, obtains a blank Excavation Permit and completes as much of the permit as possible. A Competent Person (see Definitions section) must be assigned to the excavation; the assigned competent person may be an employee of a contractor.
2	The permit initiator reviews the permit with Solutia utilities supervision.
3	Solutia utilities supervision: • Reviews the permit and the excavation plans to ensure all information about underground service lines is known and considered. • Provides telephone numbers as needed for each of the public utilities. • Signs the Excavation Permit to indicate utility underground service lines were reviewed.
4	The permit initiator reviews the permit with their company's environmental personnel.
5	The environmental representative: • Reviews the excavation plan and determines soils analysis and storage requirements. • Arranges the necessary sampling and analysis. • Signs the Excavation Permit to indicate this environmental review was completed.
6	The excavation initiator copies, then posts, the completed Excavation Permit in a plastic cover near the excavation. The copy allows re-posting if the original permit is lost.

Follow-Up and Precautions

The excavation initiator is also responsible for:

- Notifying the public utility of the excavation in the area of their service and provide other data they may require.
- Notifying operations supervision, including Rhodia, of any excavation within 100 feet of operating facilities prior to work to allow closing doors and windows as necessary.

- Obtaining other permits as needed for the work, such as obtaining a Confined Space Entry Permit for excavations deeper than four (4) feet, which includes an oxygen level measurement.
- Communicating information on utilities and other service lines located during excavation work to drafting personnel so plant maps may be updated.
- Working with the Environmental Group on soils storage, analysis and disposal.

The assigned Competent Person is responsible (the excavation initiator is still accountable) for:

- Ensuring that precautions listed on the permits and OSHA requirements are observed.
- Ensuring that all working on the excavation know who the Competent Person is.
- Arranging proper soils storage as determined by the Environmental Group.
- Having excavated soil wetted as necessary to prevent dusting.
- Inspecting the excavation daily for hazardous conditions such as failure of protective systems or anything that could cause a cave-in.
- Barricading the excavation to prevent falls.
- Shoring excavations with vertical walls deeper than four (4) feet of soil or excavating to a maximum angle of repose of 34° measured from the horizontal. This is 1.5 feet horizontal for every one foot vertical. That means a 10 foot deep excavation must be at least 30 feet wide. Poor soil conditions like sand may require other precautions - contact the safety department. Shoring may not be removed until all work in the excavation is complete.
- If the excavation is deeper than four (4) feet, providing:
  - Ladders every 25 feet for safe egress.
  - Pedestrian crossings walkways with standard guardrails.
- Preventing workers being underneath loads handled by lifting or digging equipment or being near vehicles being loaded or unloaded.
- Protecting workers from excavated or other materials that could pose a hazard by falling or rolling into excavations.
- Notifying utilities supervision immediately if utility lines are damaged or broken during excavation.

- Supporting exposed utility lines in the excavation every fifteen (15) feet.
- Ensuring limestone backfill is power tamped in twelve (12) inch layers up to grade level.
- Ensuring cleanup and resurfacing is prompt to ensure soils are not blown or tracked around the plant.
- Notifying operating supervision, including Rhodia, of facilities within 100 feet of the excavation, that the work is complete.

Record Retention, Revision History, Approvals

Record Retention

The excavation permit initiator returns the completed Excavation Permit to the Union Walker for review and one year filing.

Revision History

Recent revisions to this document are summarized below.

Date	Text Affected
2/95	• Total re-write and format change. • Added to Policy that each Excavation Permit Initiator has overall accountability for compliance with this procedure. • Added to Policy that excavations greater than four feet in depth are confined spaces and must also follow Plant Procedure 786, "Confined Space Entry." • Added *Competent Person* to Definitions, Procedure and Permit, and divided responsibility appropriately with the excavation initiator. • Added OSHA requirements for daily inspection of the excavation, not working under lifting and digging equipment, and not removing shoring until all work in the excavation is complete. • Added copying the permit and posting the permit, enclosed in a plastic cover. • Added notifying supervision of nearby facilities when the work is complete. • Added Document Control of the Permit after completion of the excavation, which is returning it to the Safety and Loss Prevention Coordinator for review and six months filing. • Added to the permit a reminder to notify supervision of nearby operations facilities prior to starting excavations.

Date	Text Affected
	• Deleted summary of this procedure from the Excavation Permit.
5/01	Deleted references to Monsanto and inserted Solutia Changed document retention period from six months to one year. Changed document reviewer from Safety and Loss Prevention Coordinator to Union Walker Basic format changes Updated Review and Approvals

Reviews and Approvals

Author: Mark Peal, Safety Specialist — Date

Review: Alan Faust, ESH Leader — Date

Review: Russ Kuttenkuler, Queeny Site BTL — Date

Approval: Robin K. Prokop, Plant Manager — Date

EXCAVATION PERMIT

PERMIT PERIOD _____

COMPETENT PERSON: _____

NOTE: When utility lines are damaged or broken while excavating, call utilities department station 1583.

LOCATION OF EXCAVATION WORK:

_____

_____

_____

PREPARATIONS TO BE MADE PRIOR TO EXCAVATION WORK

			YES	NO
1.	(PI&U)	Determine location of all underground utility lines near excavation by checking all underground utility maps. Also indicate all underground utility lines on excavation permit sketch. (Back side of this form.)	[]	[]*
2.	(U)	Notify appropriate city of St. Louis utility Co. when their utility lines are in the immediate area to be excavated.	[]	[]*
		a. Bell Telephone Co. 1-800-344-7483	[]	[]
		b. Laclede Gas Co. 535-7700	[]	[]
		c. St. Louis Metropolitan Sewer District 768-6260	[]	[]
		d. City Water Co. 771-4880	[]	[]
		e. Union Electric Co. 342-1000	[]	[]
3.	(PI)	Determine with your Environmental Group requirements for soil sampling, analysis, and storage.	[]	[]*
4.	(PI)	Notify all operating supervision of facilities within 100'.	[]	[]

* Items checked "No" must be explained in Line 9.

PRECAUTIONS TO BE TAKEN DURING EXCAVATION WORK

5.	(PI)	Protective Equipment Requirements:		
		a. Electrically insulated boots & gloves	[]	[]
		b. Electrically insulated blanket	[]	[]
		c. Eye Protection (Circle as Required) Goggles, Face Shield, Safety Glasses with Side Shields	[]	[]
		d. Other Protective Equipment	[]	[]
6.	(PI)	Barricades	[]	[]
7.	(PI)	Shoring Requirements: Shore vertical walls deeper than 4 feet. If not, walls must be excavated to an angle of repose of 34°. This is 1.5 feet wide on each side for each foot deep. Contact safety for loose soils requirements.	[]	[]
8.	(PI)	Fire Permit Required	[]	[]
9.	(PI)	Confined space entry permit required when excavation is deeper than 4'.	[]	[]
10.		Special Precautions (walkways, ladders every 25 feet, etc.)_____		

_____

_____

11. Explanation of Exceptions_____

_____

Initiated by	Date /Time	Utilities	Date/Time	Environmental	Date & Time
Approval		Group Approval			
POST AT EXCAVATION SITE		J. F. QUEENY PLANT		SOLUTIA	ST. LOUIS, MO

PI = Permit Initiator U = Utilities

Form 713-1 Revised 7/01

EXCAVATION SKETCH

Write in Street Names and Buildings; Show location of underground utility and service lines; and Circle area to be excavated.

PI = Permit Initiator U = Utilities
Form 713-1 Revised 7/01

Purpose

To ensure a Process Hazard Analysis (PHA) is completed before implementing certain changes or additions to plant processes or facilities.

Execution of PHA's per this procedure will assure compliance with Process Safety Management (OSHA 1910.119), Solutia capital project management policies, and general good manufacturing practice.

Policy

A PHA shall be conducted for capital or expense projects involving:

- Modifications or additions to existing processes or facilities,
- New processes or facilities,
- Major dismantling projects.

The PHA checklists in Appendix A are also used when needed to complete the PHA requirements of Plant Procedure 709, "Management of Change".

Contents

This procedure covers the following topics.

Attachments

The following are attached.

Attachment	Title
Appendix A	PHA Checklist

References

The following references are important.

Reference	Title
Plant Procedure 709	"Management of Change"
Solutia ESH Commitment 4.2.4	"Process Hazard Analysis"
Plant Procedure Instruction 716-001	"Lifting In Manual Handling Tasks"

Definitions

The following definition is important:

Term	Meaning
Highly Hazardous Material (HHM)	The following materials have been identified as HHM's within Solutia: Ammonia (anhydrous) Chlorine Formaldehyde/Formalin Hydrofluoric Acid Hydrogen Cyanide Hydrogen Sulfide Phosphorous Phosphorous Trichloride &Oxychloride Sulfur Dioxide

The PHA Process

Responsibilities

The Project Team shall be responsible for:

- Scheduling and conducting the following PHA reviews:
  - Pre-project,
  - HAZOP (if required).
  - Design,
  - Pre-startup,
- Documenting reviews
- Follow-up on all concerns identified in the reviews

Pre-Project Review Requirements

Prior to issuance of the engineering front-end package the project team will hold a pre-project review to identify potential safety, health and environmental concerns which could have a major impact on project cost and/or schedule.

The review should include, at a minimum, representatives from the project

team, ESH, and manufacturing.

Assemble the following information and deliver it to the review attendees prior to the meeting:

- SMP and Process Amendment (if required by Plant Procedure 473),
- EFD (Revision A),
- PFD (Revision 0),
- Plot plan/equipment arrangement,
- Completed checklist (Appendix A),
- Material Safety Data Sheet (MSDS) for all raw materials and finished products,

Review this information during the meeting, along with appropriate sections of the checklist, to describe the project.

Modifications or additions to processes in which an HHM is used may be subject to a HAZOP study. Decide at this time if a HAZOP is required.

From the meeting document the following:

- A brief project description,
- Meeting attendees
- A summary of questions/concerns.
- Follow-up responsibilities.

At a minimum, this document shall be maintained by the Project Team and circulated to the ESH group.

Hazard and Operability (HAZOP) Review Requirements

A HAZOP is required for modifications to a process which uses HHM's. Queeny currently uses only one HHM, anhydrous ammonia, which is diluted as it is unloaded for use in L-Aspartic acid, and becomes non-HHM after dilution.

Hold a HAZOP review as soon as EFD revisions are completed following the pre-project review, and prior to issuance of the engineering front-end package.

The HAZOP team will consist of a minimum of four and a maximum of six people. Three members of the team shall be:

- A leader trained to lead a guide word HAZOP,
- An operator trained on process details,

- A process/project engineer from the project team.

The remainder of the team should consist of engineers, operators, mechanics and/or a business Team Leader or Operations Coordinators knowledgeable of the chemical process.

The project team will provide the following information for use during the HAZOP review:

- A current set of EFD's for each participant,
- A current set of plot plan/equipment arrangement drawings,
- A current set of PFD's.

The following information should be available if needed:

- Physical, chemical and toxicological properties,
- Operating procedures/instructions,
- Vessel design information,
- An interlock list and classification,
- Relevant incident/accident investigations,
- Previous audit reports.
- HHM guidelines,
- Electrical classifications,
- Fire protection information.
- Emergency pressure relief documentation.

The team shall:

- Define the boundaries of the study by marking up a set of EFD's designated as the record set,
- Conduct the guide word HAZOP,
- Prepare the HAZOP report.

The HAZOP report shall contain the following information:

- Boundaries of study,
- Study participants,
- Dates of study,
- Summary of major concerns,

- HAZOP worksheet(s).

At a minimum, this report shall be maintained by the Project Team and circulated to the ESH group.

The Project Team is responsible for addressing the concerns before engineering front-end package submittal.

Design Review Requirements

The project team will conduct a design review prior to issuance of the design package, to identify any environmental, safety and health concerns. This review should be conducted after design is essentially complete.

At a minimum the design review shall consist of a representative from the Project Team, ESH, and manufacturing. If possible a representative from construction should attend.

Make the following information available:

- Design package(s) (Mechanical, E&I),
- Documentation from previous hazard reviews,
- A completed checklist (Appendix A).

This review shall address the resolutions of previous concerns and review the design package(s) and the completed checklist. Additionally, any changes made after the pre-project review shall be evaluated to identify potential hazards.

The following information shall be documented:

- Standard Manufacturing Process,
- Interlock list,
- List of relief devices and documentation,
- Resolutions of concerns from prior reviews,
- A summary of new questions/concerns,
- Follow-up responsibilities.

At a minimum, this document shall be maintained by the Project Team and circulated to the ESH group.

Pre-Startup Safety Review

Policy

The OSHA PSM Standard states that the employer shall perform a pre-startup safety review for new facilities, and for modified facilities when the modification is significant enough to require a change in process safety information.

We voluntarily extend this requirement to all our manufacturing units.

Execution

Prior to chemical introduction, the Project Manager, Project Team Leader, or an appointed project team member will conduct a pre-startup safety review meeting.

Attendees must include, at a minimum, a representatives from: the project team, ESH, the Training Coordinator, operations, and construction.

The project team will provide the following for the meeting:

- EFD's,
- Documentation from previous hazard reviews,
- Checkout documentation (Mechanical, E&I),
- Equipment inspection documentation,
- Procedures (operating, maintenance, emergency),
- Training documentation.

The pre-startup review will confirm, and the minutes will document, that:

- Construction has been completed according to design specifications,
- Training of each employee has been completed,
- Safety, operating, maintenance, and emergency procedures are in place and adequate,
- A Process Hazard Analysis has been performed and all of the recommendations have been addressed,
- Previous concerns are resolved.

Additionally, any changes made after the design review shall be evaluated to identify potential hazards.

A safety walk-through may be conducted at the discretion of the review attendants.

Any remaining open issues, plus any new issues that are identified, will be recorded on a "final punch list". Resolution of these issues will be completed prior to the introduction of chemicals. A "minor punch list" might also be agreed

upon in the meeting, listing items which need not prevent startup.

Upon completion of the pre-startup safety review and resolution of the remaining issues, a summary of the meeting minutes will be assembled and issued to the project team, manufacturing, ESH, and management.

In addition, the final punch list should be attached to the meeting minutes documenting that the final set of issues have been resolved.

Minutes from the pre-startup safety review will be retained in the departments Process File along with all the meeting minutes of previous project reviews which could include: EFD review, pre-project ESH review, HAZOP review, operability/maintainability review, design review, department safety walkthrough, ergonomics review, etc.

These records must be retained until the department's next In-Depth Safety Audit. At that time it is incorporated into the Process Hazard Analysis portion of the In-Depth Safety Audit.

Document History and Approvals

Revision History

Recent revisions include.

Date	Text Affected
10/98	Initial writing, taken from WGK ESH03 procedure.
1/99	Included expanded wording on Pre-Startup Safety Reviews. These added instructions focus mainly on how the review should be documented.
7/99	Added Item 18 d., in Section G., Machinery and Equipment of the checklist to address Y2K readiness.
7/00	Added reference to Solutia ESH Commitment 4.2.4. Added definition of HHM. Removed requirement that HAZOP is conducted on process modifications which involve flammables. Added heptane in Q-Flex QDI as a flammable currently used in plant. Added lifting evaluation requirement, new item c. to section F.5 of checklist and modified list accordingly. Added "critical piping" to section G.15, item 'n.' Added questions in Section G. 9. and G. 10. regarding necessary changes to vessel and critical piping inspection frequencies and

Date	Text Affected
	the need to contact the Materials Technology Group. Added reference to Plant Procedure Instruction 716-001. Modified section G. 11. Of checklist to reflect the use of an 8-hour TWA. Changed Bob Cheever from reviewer to author, added Bob Gale as a reviewer and changed Plant Manager approval from Jim Hart to Robin Prokop.
04/01	Following additions made to the checklist to strengthen the equipment/structural grounding review to allow for the obsolescence of Plant Procedure 328: • A. 11 and corrected the numbering sequence that follows; • C. 15 • G. 5 and corrected all of the numbering sequence that follows; • G. 17. c. Changed reviewer to Mark Peal from Bob Gale.

Reviews and Approvals

Author: ESH Coordinator, Robert L. Cheever Date

Review: Safety Specialist, Mark L. Peal Date

Review: Queeny Site Leader, Brad Young Date

Approval: Plant Manager, Robin Prokop Date

Appendix A: PHA Checklists

A. Buildings/Structures	Yes	No	N/A
1. Do platforms, stairs, ramps and fixed ladders meet OSHA/corporate standards? (handrails, toe plates, etc.)			
2. Is floor within loading limits?			
3. Are hoists, monorails and elevators assessed for capacity limitations and stenciled for load capacity?			
4. Are sufficient exits provided/identified?			
5. Do design and construction materials meet NFPA standards?			
6. Is head clearance adequate and are tripping and bump hazards eliminated in work areas and walkways?			
7. Are platforms and sufficient clearance provided around equipment/storage racks for conducting maintenance and operations safely?			
8. Are roof vents and drains provided?			
9. Is explosion relief provided? Is documentation complete and on file?			
10. Is lightning protection and structural/equipment grounding for electrical discharges provided?			
11. Is the grounding adequate (i.e. a resistance of 1 ohm or less)?			
12. Is building drainage (inside and outside) properly trapped?			
13. Control Room			
a. Are temperature, humidity and dust control systems provided?			
b. Is room located on ground floor?			
c. Are spacing requirements for accessibility met?			
d. Is fire protection provided?			
e. Is emergency lighting provided?			
f. Is positive ventilation provided?			
g. Is air filtration/cleaning provided?			
Comments:			

B. Control Systems	Yes	No	N/A
1 Is adequate room provided to operate electrical controls?			
2. Are fail-safe controls and interlocks included in design?			
3. Are interlocks/alarms classified per Plant Procedure 316? Is classification documented and on file?			
4. Are interlocks added to the periodic testing program?			
5. Are the consequences of engineering control failure being considered?			
6. Is a backup control system considered?			
7. If a Class 1 or 2 interlock is being changed, by-passed or deleted, has it been approved following Plant Procedure 316?			
Comments:			

C. Electrical	Yes	No	N/A
1. Does electrical equipment comply with proper electrical hazard classifications?			
2. Is adequate power available?			
3. Is motor control center located to prevent corrosion of components?			
4. Is positive ventilation provided in the motor control center?			
5. Are critical circuit breakers and switchgear easily accessible?			
6. Are local switches/breakers required for equipment and machinery?			
7. Are emergency lights provided?			
8. Are cable trays free from potential exposure to fire?			
9. Are alternate power supplies/routings available for critical loads?			
10. Are electrical power disconnects installed where lockout is required?			
11. Is proper clearance provided for electrical equipment?			
12. Is electrical equipment properly labeled?			
13. Is an adequate uninterruptible power source or emergency power system available for safe shutdown?			
14. Are equipment grounding requirements met?			
15. Is grounding adequate (i.e. a resistance of 1 ohm or less)?			

C. Electrical	Yes	No	N/A
Comments:			

D. Environmental (Note: This section is mandatory)	Yes	No	N/A
1. High Hazard Materials (HHM)			
a. Are HHM guidelines followed?			
b. Was a hazard and operability study (HAZOP) done for the HHM?			
c. Is an area monitoring/alarm system provided?			
2. Air			
a. If an air emission source or control device is being added/modified/eliminated, has the environmental department been consulted?			
b. Were permits obtained for modifying an existing air emission source? Permits require a minimum of 90 days to obtain.			
c. Are changes to fugitive emission sources being considered?			
d. If a distillation column is being modified/installed, has the environmental department been consulted?			
e. If a boiler is being modified/installed, has the environmental department been consulted?			
f. If a 10,000+ gallon organic chemical storage tank is being modified/installed, has the environmental department been consulted?			
g. If equipment containing chlorofluorocarbons (CFC) is being modified/installed/dismantled, has the environmental department been consulted?			
3. Solid Waste			
a. If new waste is generated, has the environmental department been consulted?			
b. If physical form or composition of existing waste is changed, has the environmental department been consulted?			
c. Is waste storage being considered?			
d. If a RCRA storage tank is being modified, has the environmental department been consulted?			
e. If the volume of waste is being increased/decreased, has the environmental department been consulted?			
4. Excavation			

Appendix A: PHA Checklists (continued)

D. Environmental (Note: This section is mandatory)	Yes	No	N/A
a. Is the environmental department informed of excavation?			
5. Sewer			
a. If a sewer discharge is being added, has the environmental department been consulted?			
b. If a wastewater pre-treatment facility is being modified or constructed, has the environmental department been consulted?			
c. If type and volume of material being discharged to sewer is changed, has the environmental department been consulted?			
Comments:			

E. Fire Protection Systems	Yes	No	N/A
1. Is adequate looping, cathodic protection and sectional valves provided on fire mains?			
2. Are location and monitors for hydrants being considered?			
3. Are standpipes provided?			
4. Are fixed automatic/manual extinguishing systems provided?			
5. Are special fire detection systems provided? (rise in temperature alarms, sprinkler system flow alarms, smoke and flame alarms, etc.)			
6. Is pressure, quantity, duration and reliability of fire water supply adequate?			
7. Are fire suppression systems adequate? (deluge, sprinkler, foam, CO_2, etc.)			
8. Is drainage adequate for deluge or sprinklers?			
9. Are barriers (dikes, fire walls, clearance zones) provided to prevent spread of fire?			
Comments:			

F. Industrial Hygiene (Note: This Section Is Mandatory.)	Yes	No	N/A
1. Radiation			
a. Is use of radiation devices (flow/level indicators) avoided?			
b. Are sources of non-ionizing radiation being considered?			
2. Thermal Stresses			
a. Are hazards from operating conditions that could produce extreme heat or cold stress to workers avoided?			
3. Exposure Control			
a. Are potential exposure conditions during charging, sampling, loading or unloading operations avoided?			
b. Are ventilation systems being considered to reduce exposure?			
c. Are A/C systems designed with exposure control in mind?			
d. Are operating conditions designed to limit requirements of personal protective equipment?			
e. If a solid material is involved, is the potential for dust being evaluated?			
f. If an eating facility is being added or modified, has the industrial hygiene department been consulted?			
4. Asbestos/Lead			
a. Is structure or piping free from asbestos and lead?			
5. Ergonomics (For details: Refer to Ergonomic Design Standard)			
a. Is the workplace designed to minimize physical strain? (lifting, valve location, controls, switches, stand/sit work stations, reaching, accommodate short, tall, big workers))			
b. Is the workplace designed to minimize frequent bending or other repetitive body motions?			
c. Are routine lifting tasks evaluated against applicable lifting guidelines such as NIOSH and University of Michigan? (See Procedure Instruction 716-001)			
d. Are lifting devices provided to assist with heavy or awkward loads?			
e. Are gages, meters and recorders easy to read? (i.e. Don't have to reach or stretch to read, can read if worker has bifocals, no vibration, glare, no extraneous/unwanted info, free from dust/dirt, enough light to read)			
f. Is equipment placed to provide adequate space for required job tasks, repair and service?			
g. Are lighting requirements met?			

F. Industrial Hygiene (Note: This Section Is Mandatory.)	Yes	No	N/A
Comments:			

G. Machinery/Equipment	Yes	No	N/A
1. Is machinery/equipment accessible for maintenance and operation?			
2. Are provisions made for mechanical lockout?			
3. Are remote shutdown switches provided?			
4. Is insulation provided for personnel protection?			
5. Is grounding necessary and adequate (i.e. resistance 1 ohm or less)?			
6. Are guidelines for selecting the appropriate site glass or glass liquid level gage followed?			
7. Is the design for sizing of relief devices approved by the safety department and filed in the operating information file (OIF)?			
8. Are discharges from relief devices/overflow lines located to avoid hazard to equipment and personnel?			
9. Are discharges from relief devices/overflow lines properly contained?			
10. Is equipment included in the preventive maintenance schedule? Are additions to the vessel and critical piping inspection schedule necessary and has the Materials Technology Group been notified?			
11. Is the frequency of inspection for existing equipment changed? If so, has the Materials Technology Group been notified?			
12. Is the noise level of the equipment/operating conditions below 80 dB-A, 8-hour TWA? Ear protection is required at levels above 85 dB-A.			
13. Are materials of construction compatible with process materials during normal and transient conditions?			
14. Is the impact of equipment leakage considered?			
15. Rotating Equipment			
a. Are guards for rotating equipment provided?			
b. Is vibration monitoring provided?			
c. Is lubrication monitoring provided?			
d. Is overspeed protection provided?			
e. Is pump deadhead protection provided?			

G. Machinery/Equipment	Yes	No	N/A
16. Piping and Valves			
a. Are pipe supports and guides provided?			
b. Are expansion joints provided for potential temperature, pressure, vibration and material variation?			
c. Is steam or electrical tracing provided?			
d. Have drains/blowout/bypass valves been provided?			
e. Are pressure relief lines free from block valves?			
f. Are double block and bleed valves provided for positive isolation and lockout/tagout?			
g. Are manually operated valves, switches and controls in a safe location and accessible in case of emergency?			
h. Are plant piping standards utilized?			
i. Are all open-ended sample and drain lines pointed down below eye level and without quarter-turn valves?			
j. If quarter-turn valves are used, are round handles used on valves smaller than 2"?			
k. Are plugs provided in quarter-turn valves?			
l. Is the use of flexible fittings avoided?			
m. Are flange guards considered on corrosive material lines?			
n. Is piping considered "critical piping" for purposes of Plant Procedure Q385?			
17. Tanks/Heat Exchangers			
a. Are dip pipes provided?			
b. Is grounding provided?			
c. Is grounding adequate (i.e. resistance of 1 ohm or less)?			
d. Are plant standards followed on nitrogen blanketing?			
e. Are coded vessels required?			
f. Are adequate manholes, platforms, ladders and cleanout openings for cleaning and maintenance of vessels/tanks provided?			
g. Are standards/guidelines followed in design of dikes?			
h. Are isolation points provided on lines for tank entry?			
i. Are safety devices (vents, valves, drains) provided for heat exchange equipment?			
18. Fasteners			
a. Are all fasteners of one thread type? (ie. fine or course)			

G. Machinery/Equipment	Yes	No	N/A
b. Do all fasteners on each piece of equipment have the same style and shape of head?			
c. If the fastener heads not the same are they quick release?			
d. Were captive fasteners used to avoid any occurrence of loose nuts and/or washers?			
e. Were all fasteners limited in length so that fewer than 10 turns are required to remove the fastener?			
19. Equipment Standards			
a. Relative to other equipment at this site, were all items included in this design considered "standard"?			
b. Was the equipment designed such that no special purpose tools are required to perform maintenance?			
c. Are controls for dissimilar functions shaped and/or color coded differently?			
d. Do date sensitive equipment and programmed date functions properly handle end-of-year, and leap year?			
Comments:			

H. Material Handling	Yes	No	N/A
1. Do fork lifts have compatible fuel/power supply for the area of use?			
2. Loading/Unloading Facilities			
a. Are provisions made to prevent cross-contamination?			
b. Are corporate specifications followed? (spacing , fall protection, safety equipment, etc.)			
c. Is spill control provided?			
Comments:			

I. New Chemicals, Materials, By-Products & Wastes	Yes	No	N/A
1. Is the new chemical/material evaluation completed by the environmental and industrial hygiene departments?			

I. New Chemicals, Materials, By-Products & Wastes	Yes	No	N/A
2. Are MSD sheets on file for all materials/chemicals?			
3. Is the interaction matrix and supporting data provided for a new chemical?			
Comments:			

J. Organizational (For Changes in Organizations)	Yes	No	N/A
1. Has the person been adequately trained?			
2. Does the person fully understand responsibilities, including areas of environmental, safety and industrial hygiene?			
3. If the person is involved with emergency response, have these duties been assigned to other personnel?			
4. Has the union been informed?			
Comments:			

K. Plant Layout	Yes	No	N/A
1. Does the area drain adequately?			
2. Is adequate perimeter clearance provided?			
3. Is guarding from perimeter pedestrian/vehicular traffic provided?			
4. Are spacing requirements met?			
5. Are provisions made for hazardous underground or overhead obstructions? (power lines, fire mains, sewers, etc.)			
6. Is approval obtained for structures over 65 feet?			
7. Is area assessable by large mobile equipment?			
Comments:			

L. Process	Yes	No	N/A
1. Are potential consequences of deviating from normal operating ranges considered?			
2. Is the impact on normal process chemistry evaluated?			
3. Is the impact on capacity/compatibility of existing systems evaluated? (relief systems, cooling/heating, residence time, etc.)			
4. Are effects to emergency systems (interlocks, alarms, pressure relief, etc.) considered?			
5. Are upstream or downstream equipment/process effects considered?			
Comments:			

M. Safety Equipment/Protection	Yes	No	N/A
1. Are safety showers, eye bath stations and immersion tubs provided?			
2. Is safety equipment provided and are locations clearly indicated? (respiratory protection, hearing protection, protective clothing, hose stations, fire extinguishers, etc.)			
3. Are special communication devices provided? (emergency telephones, radios, public address systems, paging systems, etc.)			
Comments:			

N. Sewers	Yes	No	N/A
1. Are plant standards (C2 STD 1, 2 and 3) followed?			
Comments:			

O. Storage Of Flammables/Combustibles	Yes	No	N/A
1. Are safe atmospheres maintained throughout the system? (inert gas blanketing, fuel concentration control, etc.)			
2. Is fire protection provided?			
3. Are flammable/explosive dust hazards eliminated?			
4. Are emergency vents, flame arrestor and/or relief valves provided?			
5. Do tanks/vessels meet spacing requirements? (isolation from possible ignition sources)			
6. Is explosion protection (weak seam roof, deflagration venting, containment, explosion suppression, inerting, etc.) provided?			
7. Is a dependable refrigeration system provided for critical chemicals?			
8. Are remote isolation requirements met? (control valves, dip pipes)			
9. Is reactive or explosive storage in approved, designated area?			
10. Are flammable supplies (paint, oil, solvents, lab supplies, etc.) stored in an approved designated area?			
Comments:			

P. Utilities (Air, N_2, Water, Steam)	Yes	No	N/A
1. Does cooling tower have fire protection and fan vibration monitoring?			
2. Is breathing air provided?			
3. Is city/fire water backup provided?			
4. Is instrument air backup provided?			

Appendix A: PHA Checklists (continued)

P. Utilities (Air, N_2, Water, Steam)	Yes	No	N/A
5. Are combustion safeguards provided on furnaces?			
6. Are fuel gas shutoff valves provided?			
7. Are utility capacities adequate?			
8. Is back-flow prevention included for potable water?			
9. Is the use of lead avoided in potable water service?			
Comments:			

APPENDIXE

Table E-1
Solutia-J.F. Queeny Plant
Environmental Indicators Evaluation – Human Exposures
Summary of Results – Human Health Risk Assessment, July 2002

	CTE[1]		RME[2]	
Former Acetanilides Production Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	5.E-06	0.6	3.E-05	1
Future Outdoor Site Worker	9.E-08	0.008	4.E-06	0.03
Future Site Trespasser	1.23E-08	0.0002	2.07E-07	0.001
Future Indoor Site Worker	2.E-06	0.5	8.E-06	1

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	CTE		RME	
Former Boiler Stag Accumulation Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	1.E-09	0.4	1.E-08	0.7
Future Outdoor Site Worker	1.E-07	0.3	2.E-06	0.5
Future Site Trespasser	2.E-09	0.002	5.E-08	0.02

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	CTE		RME	
Former Bulk Chemical Storage Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	1.E-07	0.1	1.E-06	0.09
Future Outdoor Site Worker	2.E-06	0.05	2.E-05	0.1
Future Site Trespasser	6.E-08	0.0009	1.E-06	0.004
Future Indoor Site Worker	8.E-07	1	4.E-06	3

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	CTE		RME	
Former Coal Storage Yard	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	2.E-11	0.00002	7.E-11	0.00002
Future Outdoor Site Worker	2.36E-10	0.000006	2.36E-09	0.00001
Future Site Trespasser	1.02E-11	0.0000002	1.36E-10	0.0000006
Future Indoor Site Worker	3.E-07	0.002	1.E-06	0.003

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	CTE		RME	
FF Building Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	7.E-09	0.009	5.E-08	0.06
Future Outdoor Site Worker	9.10E-08	0.002	1.30E-06	0.007
Future Site Trespasser	3.93E-09	0.0001	7.46E-08	0.0003
Future Indoor Site Worker	3.E-05	0.5	7.E-04	0.5

[1] CTE denotes Central Tendency Exposure
[2] RME denotes Reasonable Maximum Exposure

Table E-1
Solutia-J.F. Queeny Plant
Environmental Indicators Evaluation – Human Exposures
Summary of Results – Human Health Risk Assessment

	CTE		RME	
Former Quarry Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	4.E-08	0.01	4.E-07	0.02
Future Outdoor Site Worker	4.E-07	0.007	5.E-06	0.02
Future Site Trespasser	2.E-08	0.0002	3.E-07	0.0009
Future Indoor Site Worker	-	0.000009	-	0.000009

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	CTE		RME	
VV Building Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	4.E-08	7	4.E-07	21
Future Outdoor Site Worker	1.E-06	0.3	4.E-05	1
Future Site Trespasser	4.E-08	0.006	2.E-06	0.05
Future Indoor Site Worker	5.91E-08	0.0007	3.00E-07	0.0007

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	CTE		RME	
WW Building Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	4.E-10	0.003	3.E-09	0.003
Future Outdoor Site Worker	8.E-09	0.006	2.E-07	0.01
Future Site Trespasser	3.E-10	0.0001	7.E-09	0.0005
Future Indoor Site Worker	1.40E-07	0.0006	7.21E-07	0.0006

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	CTE		RME	
KK Building Area	**Risk**	**Hazard**	**Risk**	**Hazard**
Future Construction/Utility Worker	2.E-07	0.01	1.E-06	0.01
Future Outdoor Site Worker	4.E-06	0.008	6.E-05	0.02
Future Site Trespasser	1.E-07	0.0002	3.E-06	0.001
Future Indoor Site Worker	-	0.04	0.00E+00	0.1